

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS
edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, DECEMBER 14, 1906.

The French railroads are perhaps subject to more criticism than those of any other country, due largely to the fact that the nation is, as it were, the partner of the six great companies, and has by original contract extensive powers of supervision. Add to this the large socialist element, including many public men of great ability, who watch for every opportunity to point out any weakness in the existent state of things. Of late years there has been a strong movement to compel the companies to improve the condition of their employees in various ways. It is doubtless to show that the companies have done a great deal without legal compulsion that Dr. Lemercier, Secretary of the Eastern Company, prepared a comparison of certain facts in 1890 with those in 1904. We give below only the percentages of increase:

	Increase, per cent.
Mileage worked.....	14.8
Number of employees.....	16.9
Train-miles.....	32.2
Gross earnings.....	31.1
Working expenses.....	28.8
Wages and other payments, on account of employees.....	38.4
Taxes.....	20.6
Dividends.....	1.3
Expenses for pensions and other benefits of employees.....	88.0

The last entry is included in the statement of wages, etc., further up, but it is particularly striking at this time. In amount, the increase in these expenditures for the benefit of employees since 1890 has been \$6,531,000, against an increase of \$394,000 in the amount paid in dividends to stockholders. The number of pensioners has increased from 27,670 to 66,868; the average yearly pension from \$182 to \$210.

Notable accidents always bring a lot of letters to the Editor of the *Railroad Gazette*, and the rear collision at Lawyer, Va., November 29, is no exception. Most of the letters of this kind usually have to go unprinted. New "copy" on an old subject is available only when the writer succeeds in putting the ideas in a new way. In the present case, however, a rather novel situation is met with. The first letter to arrive says:

"The deplorable accident in which President Spencer, of the Southern Railway, was killed, shatters one of the oldest traditions of the railroad world—the fond belief that officers' cars on the hind end of trains are always safe, because when an officer is aboard the train the rear brakeman is always particularly alert in the performance of his duty. What was the matter in this instance? So far as I have been able to learn from the newspapers, the two trains had left the last preceding station about eight minutes apart. Is not this length of time sufficient for a flagman to get back? It will be of special interest to learn what this flagman has to say for himself. Is the spirit of loyalty in brakemen so weak and unreliable that a flagman performs his duty when the president of the road sits in the car looking out of the window, but neglects it when the same officer is known to be asleep in his stateroom?"

Whether or not the time interval between these two trains was more or less than eight minutes at Rangoon we are not precisely informed. On many roads the regular time interval between trains, where the block system is not in use, has been five minutes, so that we may assume that even less than eight minutes between the trains at Rangoon would have been deemed a reasonable interval. But if the second train ran materially faster than the first this interval might easily have been reduced in running three or four miles. Another question that may remain unsettled will be that as to how soon or how energetically the flagman went back. In the old times, before the block system was so common, the ideal flagman was one who got off his train before it stopped and ran back at the top of his speed. It is doubtful if such flagmen are as plenty now as they were ten years ago. They were none too plenty then. As to officers' cars, a special train consisting wholly of officers' cars (or a single car), which is a familiar sight on most railroads, usually affords a striking illustration of the confused way in which we try to use both the block system and the hand-flagging system, and how poorly we patch the two systems together. The officers' train usually has on it one of the best looking brakemen, wearing a comparatively new uniform, and carrying a brand new flag. Every time the train stops he goes back a few yards. If the stop lasts one or two minutes he goes back a few rods. If it lasts longer he goes even farther than this, but at best he seems to usually make it his primary object to stay with his train; and the manager, riding in the car, tacitly approves of the brakeman's conduct. Yet the brakeman does not really carry out the flagging rule at all, for the time of greatest danger to the rear of a train which is depending on the flagman for protection is when he is returning preparatory to the resumption of the train's journey. During this time the only protection is that afforded by the torpedo, and the flagman in the case we are considering has not used torpedoes at all. (We are speaking now of the ordinary frequent doings of the special-train flagman.) The man goes back so as to be prepared to carry out the rule, but he does not actually carry it out. If the block system is in effective use all these efforts of the brakeman are useless. If the trains are run by time-interval he may be doing all right as far as regular trains are concerned, for he may not be within an hour or more of any schedule; but if he aims to protect against every possible train, the non-use of the torpedo makes his act almost wholly useless. In connection with the Virginia collision it is said that the brakeman could have stopped the following train if it had not been for a curve in the road; but curves in the road are just what the flagging rule is provided for. As to the average brakeman's respect for a superior officer who is known to be asleep we cannot say; but it is clear that on special trains that make frequent stops at unusual

places the average brakeman has great difficulty in carrying out the flagging rule according to its letter, however laudable may be his attempts to show that he appreciates its spirit.

TIGHT CAPITAL IN RAILROAD FINANCE.

From time to time during the last few years we have had occasion to point out the magnitude of the absorption of railroad bonds for investment by the savings banks, especially at the East. So long as four years ago that investment process had reached such a point that, joined with existing holdings of railroad bonds by the banks, it might almost be said that the railroad bond fixed for the time the standard of return on the bank's investment and, consequently, of dividend return to the depositor. As railroad bonds of the savings bank class then sold high—often as low as a 3.75 interest basis—and municipal bonds, and also realty mortgages corresponded there followed a tendency among savings banks to reduce the dividend rate from 4 to 3½ per cent. on ordinary deposits. A good many banks, in fact, especially in New England, made such a reduction, and when they did not reduce the dividend it was because they held large blocks of older railroad bonds originally bought low. Nor was the situation relieved much by new legislation enlarging the scope of legal savings bank investment in railroad bonds and, in some states, extending it to good street railway bonds also. It was a time of loose and free capital seeking railroad investment forcing down the interest return. It is a time of very tight capital for railroads now, forcing steadily the interest return up. Consequently the savings banks are reverting to the old and higher dividend rate and probably some of them regretting that they ever cut it down.

We have used the savings bank experience here as the index and measure of the change from free to "tight" railroad capital and of a change not less remarkable for its speed than for its degree. Its phenomena loom big and conspicuous in their main features. As a generality covering the whole situation business expansion, railroad improvements, financial projects of a hundred different kinds, good and bad, outrun capital. In that sub-circle which includes the railroads just at the time when they have carried through minor improvements, largely from surplus earnings, they face tight capital as a burden on major improvements which must be financed by funds greatly in excess of surplus earnings.

The most prominent and, it may be said, logical results of the situation, such as a 4 per cent. investment rate for very high grade railroad bonds—some of them carrying good mortgage liens—convertibles, debentures, short notes carrying as high as 5 per cent. and new stock issues with the annexed "rights" need only to be mentioned. What have attracted less attention than these devices for raising new railroad funds are certain novel sub-forces in the investment motive. There the holder of the convertible bond finds it sometimes actually below par and its convertibility privilege worth less than nothing; or, in another case, where convertibility is fixed at a certain future period, he finds a low quoted premium for his bond which is in effect a market "bet" that the stock into which he is to convert will be selling at twenty to thirty points lower a few years hence at the time of actual convertibility than now. He sees his new stock rights when issued apparently knocking his stock to a point far below the figures where the subtracted rights should carry it, rumors of new rights often depressing the stock instead of lifting it, and, intrinsic railroad values in the quotations counting for much less than they should. What wonder that, under such conditions—and there are others—the investor falls into confusion and timidity. His confusion is shared by the railroad corporations themselves when in the face of tight capital, high money and the personal equation of the investor they must consider the relative expediences of new stock, new bonds and new notes in obtaining funds.

As regards, however, the railroads and their relations to tight capital, besides their fine showing in gross and net earnings, there is one ameliorating fact which has not been adequately noticed or fully measured. While railroad corporations will need great sums for improvements they will not during the coming year have to carry a heavy burden in refunding bond issues. The total is between \$60,000,000 and \$70,000,000 for some 40 railroad corporations and that total widely distributed, the largest issue being the Chicago, Rock Island & Pacific three-year notes for \$7,500,000 and the next lower the Wabash three-year notes for \$6,160,000. Out of the total amount maturing there is some \$24,220,000 or more than one-third, which is represented by old sixes and sevens, of which doubt-

less a large proportion of the holders will accept new refunding issues, though exacting a bond more favorable to the owner than would be the case in a lower money market. The less conservative holders of the maturing fives and fours can also probably be taken care of between alternative propositions of cash, extensions or new bonds of from 4 to 5 per cent., especially if they are long bonds with mortgage security. But in the latter case new borrowing power of the refunding corporation will be correspondingly impaired. It is well for the railroads confronting the stressful and prolonged conditions of tight capital that they are not soon to assume any refunding on a large scale and are now reaping the benefits of the low rate and long time refunds of the later nineties.

ELECTRIC DRIVE FOR MACHINE SHOPS.

The advantages of the electric motor drive for machine tools was discussed at some length in the *Railroad Gazette* for November 17, 1905, at which time it had come to be the accepted and standard practice for all shops where new work was to be installed or any extensive changes made in the existing power plant. The adoption of the electric drive has been quite as rapid as the development of electric railways, though with perhaps not quite the extensive application of individual motors that electricians urged at the time of the first introduction of the idea. At that time the advantages of an individual motor for each machine, no matter how small, were strenuously urged. But the anticipations of a year ago have not exactly been realized, for instead of the individual drive for all machines, there is now an almost universal grouping of the small machine driven by single motors, with individual drive for the larger ones.

Without entering into the economy of this method of shop propulsion that has been proven time and again in service, it may be well to call attention once more to a few points in which an extension of the system will be profitable. A railroad shop is particularly well suited to the electric drive, and the case described in another column is only one example in the long list of shops where the management has decided that conditions are favorable to its adoption. In this class of work large buildings are invariably required and, when the power is transmitted mechanically from a central source, long lines of shafting with the resultant high frictional resistance are required. Rush repair jobs are of frequent occurrence, demanding overtime and Sunday work, in which but a few machines, requiring a small amount of power, are used. Under these conditions the mechanical transmission of the power is wasteful, in that heavy weights of shafting and hundreds of feet of belting have to be kept in motion in order to reach the single point where the work is being done. It is here that the electric drive manifests its great superiority, since that the losses from transmission are small, and the amount of power generated can be closely adjusted to that actually used. Moreover, railroad repair shops usually consist of a number of separate buildings in each of which, under old conditions, it was necessary either to install boilers and incur the expense of special attendance, or to convey steam long distances to the engines.

The cost of power is not, however, the ranking item in railroad shops, and were this to stand alone the rate of introduction of the electric drive would probably have been much slower than it has been. The advantage of the new method lies in its adaptability or flexibility to all the requirements of a varied service, and particularly to the fact that the machine can be taken to the work instead of the work to the machine, as in the case of most old style machine shop operations. Stepping outside the domain of railroad work, a few instances of how heavy work is done with electric drive in some outside shops may be suggestive.

Where very heavy work is to be done all the operations can frequently be performed by light portable tools, fully as rapidly and with a lower labor cost for handling than where a large machine capable of carrying the piece to be shaped is used, to say nothing of the original investment. For example, in a shop where large pumping engines are built it had been customary to cast the bed-plate in three pieces, plane the edges where they came together and bolt them with finished bolts. This was done principally because of the difficulty of boring out the bearings for the main shaft and planing the footings for the bottoms of the cylinder frames. A great saving was effected by casting the bed in one piece, planing the frame footings with a portable machine similar to that used in facing the valve seats on a locomotive, and using one long boring-bar driven by an electric motor to bore the boxes in line and in

place. The cylinders of these engines were often several feet in diameter and drilling of the stud holes for the heads was an expensive piece of work. With the improved methods the cylinders were erected and then a radial drill was raised and bolted to the upper face and the holes drilled quickly and cheaply. In like manner the crankpins were turned after they were in place, and so through many other operations the machine was taken to the work instead of the work to the machine.

In railroad work the same principle holds and has already received an extensive application. It is customary to bore out cylinders, face valve seats, expand and bead tubes by means of small tools driven by electric motors, and the use of this class of tool is rapidly extending. This does not mean that the use of portable tools is to be recommended where there is work enough to keep a heavy machine busy, but it frequently happens in repair shops that there is only occasional necessity for performing some piece of heavy work for which the investment required for a stationary machine would be too great, but which can be well done by one that is portable. This is especially true in the smaller shops where the engines to be cared for are few and where it is undesirable to send them to large shops that are more fully equipped with special tools. By the proper adaptation of these means it is often quite possible to secure an economy of operation that would otherwise be out of the question.

THE BLOCK SYSTEM ON TRIAL.

The collision at Lawyer, Va., November 29, was due to a "failure of block working," as the English inspectors would say. Whether due to (1) the signalman's lack of knowledge of his duties, or (2) to his neglect, or (3) to the moral fault which leads men of experience to take dangerous risks knowingly, or (4) to a combination of these, or (5) to one of those inexplicable errors of competent men which we charge to our inability to deal with the "personal equation," are questions which evidently will not be fully settled until an investigation of the collision is held by public authority. But as the block system is in a sense on trial in the United States, and as the main thing to discuss now is the prevention of such disasters in the future, the lesson of this one may profitably be looked at as bound up with all of these five possible causes. It is fair to say that the block system is on trial, because the railroads have been slow in adopting it, and have often seemed in doubt as to which of the different methods of working the system should be employed; and because Congress has paid no heed to the recommendations of the Interstate Commerce Commission. The halting way in which some large roads have extended the use of the block system may have seemed to some smaller roads which naturally would look to the practice of the larger ones for an example, to indicate a question as to its economy and value. Such a question, if it exists, should be settled. The inaction of Congress suggests the same question. For Congress to neglect an important public question is nothing new, but if the public has any interest at all in the long lists of deaths and injuries reported by the Interstate Commerce Commission during the past five years; if Congress is really charged with the duty of discussing questions of public welfare and if the Federal Government really has the power of control over railroad operations, the facts and arguments that have been set forth by the Commission in its annual reports should have received intelligent attention.

All of the defects mentioned in the foregoing paragraphs must be considered, because all occur on nearly every prominent road. All must be cured if we are to have perfect service, and nothing less than perfect service is tolerable in this matter. The operations of manual block signaling are simple, yet they are repeated by each signalman so many times that he is in danger of making blunders because of the monotony. Though an error in performing a simple operation may be as simple as the operation itself—so simple as to defy analysis—its result may be a hundred deaths. The model superintendent, who is mortified at every evidence of imperfection in the work done under his management is, of course, doubly mortified if such an instance of imperfection results in the death of the chief officer of his road. No superintendent justifies himself in retaining incompetent or morally weak men in his signal towers, nor does he feel safe with men who may be thus deficient, unless and until he has done everything in his power to provide cures for such deficiencies; for there is no satisfaction in laying the blame for a collision on the "personal equation" when it is known that more might have been done to improve the personality that broke down.

What then can be done to insure that a collision like that which has now shocked the world will not occur on your road? In other

words, assuming that the telegraph block system is a suitable system, what is needed to make it perfect? Perhaps this question will in a measure answer itself if we separate it into the questions of detail suggested in our opening paragraph.

1. Lack of knowledge. How many years' training had each of your operators before being put in charge of a block signal tower? Under what kind of a trainer? Are all your trainers (operators who instruct new operators) required (and known) to conform to a thorough and uniform scheme of training? Does the scheme provide for drilling new men on the causes of collisions; that is, on a knowledge of the combinations of circumstances which lead to fatal errors? Have your signalmen all read the explanations of collisions due to operators' errors, which have been issued by the Interstate Commerce Commission and published quarterly in the *Railroad Gazette*? Do you keep a full record of all operators' dangerous blunders, for the benefit not only of the blunderer, but of the whole force? Are you sure that your chief despatcher knows of all these blunders? Do you test operators on those rules, depended on for safety, which come into play only on rare occasions? Do you have anything like "surprise checking" to see whether they omit required extra precautions? What are you doing to cope with the present scarcity of operators, and to provide against a possible diminution of your force which may lead a superintendent some day to take the risk of entrusting a tower to an inexperienced man? How strenuously do your superintendents fight against having "emergencies" which are taken to justify the relaxing of safeguards ordinarily deemed necessary?

2. Neglect.—How do you punish neglect, where it is not due to vicious purpose and does not result in harm? Are your operators of sufficiently high class to warrant special consideration for those who fail in some serious point now and then, so as to retain (and improve) good men in spite of lapses? Is there on every division a superintendent (or any officer) big enough in head and heart, and sufficiently free from other burdens, to give this special consideration, without impairing the general discipline?

3. Moral Weakness.—What do you do with an operator known to be untruthful? Do you make the conditions of life in the signal towers in small towns, or in the wilderness, such that young men of character are willing to stay in such positions? Would a satisfactory answer to these last two questions require such a large increase of pay that you lack the courage to tackle the question, and wink at deceptions by operators which ought to be exposed and punished? Do your operators conspire to conceal each other's delinquencies? If so, can the evil be cured? If not, what should be done? Do you recognize sleeping on duty as a moral weakness? If this vice is not cured is the superintendent morally blameless?

4. No questions are necessary concerning the combination of the foregoing; but it is pertinent to observe that the combination frequently includes another element, for which we cannot with any satisfaction hold an individual operator responsible—that of brevity of tenure. From one cause or another men resign or are dismissed before they have been long in one place. This is a real though not easily definable cause of errors. The long experience of the average signalman in England is a large factor in his reliability. What are we doing about this?

5. Do you know of any recent case of a disastrous error for which there is no possible explanation except temporary, pardonable mental aberration or deficiency? If so, please report it to the *Railroad Gazette*. We have difficulty in finding such.

The manager who is able to give himself satisfactory answers to these questions should be in a fair way of getting the best possible service that can be had with this system—the telegraph block system. We do not say that the system is satisfactory for all conditions. Our accomplishments in the matter of safety are so far below those of our English friends that to reach their standard of security has been often looked upon almost as the acme of excellence. They have made their records with what is substantially the same as the telegraph block signal—except on a few roads. Still, it is to be remembered that the English record is not immaculate. If we were equal with the British roads, to-day there would be a clear duty to do still better. If the Coleman lock-and-block or the electric train staff ought to be adopted on all important single track railroads in America to make them safe for their own officers to ride on, let us acknowledge the issue and face the problem. If all double track lines worked by the telegraph block system ought to be equipped with automatic signals within a year let us face that problem also. Unless these problems are properly and promptly dealt with there will be another to add to them; the demand of the public that automatic stops, on the principle of those in the New York subway, be put in use everywhere. Most railroad officers, we

believe, are firmly convinced that on their ordinary railroad lines their money for some years had better be spent wholly for other things which are more pressingly needed than are automatic stops; but if collisions continue to agitate the minds of people who read the newspapers it will be well to be prepared to defend this position.

In closing the discussion of his paper on "High Steam Pressures in Locomotive Service," read at the November meeting of the Western Railway Club, and reprinted in the *Railroad Gazette* November 30, Professor Goss called attention to the relation which necessarily exists between results obtained and money expended, in the advancement of scientific research. Purdue University, he said, had adopted a program of tests designed to disclose the value of steam pressure in locomotive service, and had provided itself with a locomotive especially designed to work under pressures as high as 250 lbs. as long ago as 1897. During the five years succeeding, the work was limited by the ability of the University to supply funds, and since the University funds are chiefly required for the purposes of instruction, very little could be accomplished in the way of research. Three years ago, however, through a grant from the Carnegie Institution, a considerable sum had been placed at the disposal of the University for this particular work, since which time a hundred tests had been run, the results thereof had been completely summarized, and a final report for publication had been rendered. It was an abstract of this report which he presented at the club meeting. Proceeding, he called attention to the fact that the problem, the solution of which was presented by this report, concerned only the single expansion locomotive using saturated steam. It was desirable, he said, that the same processes be now applied, first, to a single expansion locomotive using superheated steam, and later to a compound locomotive using saturated steam. This was the programme which he had mapped out for the Purdue laboratory. Unaided, a good many years would elapse before definite conclusions could be reached, whereas the importance of the subject demanded an early solution. This statement ended his reference to the matter, and while the public discussion went no further, individual members were outspoken in their desire to uphold his hands in this matter. The readers of the *Railroad Gazette* will, we are sure, join with the members of the Western Railway Club in hoping that some way may be found whereby the important researches of the Purdue laboratory may proceed with all possible expedition.

Union Pacific.

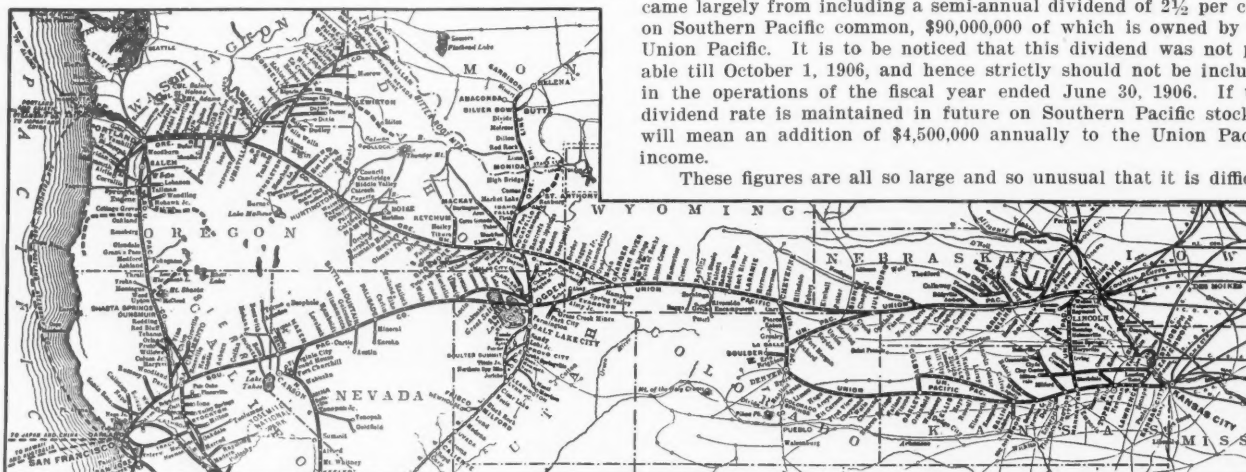
The Union Pacific is the most remarkable example in existence of the present railroad prosperity of the West. Due primarily to the great growth of traffic in its territory, and secondarily to the improvement of the line thus made possible together with an investment which has proved most profitable in the securities of the competing Hill roads to the northward, its position to-day is one of unusual strength, both as an operating railroad and as a holding com-

The Union Pacific, as an operating railroad, is made up of the Union Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Company. Under these three groups, the average mileage operated last year was 5,400. Gross earnings, not including \$402,000 from water lines, were \$66,879,142, an increase of \$8,122,296 over the wonderfully prosperous year of 1905. It will be remembered that the Union Pacific's statement of a year ago was, at the time, the most remarkably successful showing made by any railroad during that high record year. It now appears that not only has 1905 been surpassed, but surpassed by margins much greater than the increases shown that year over the results of the not specially prosperous fiscal year 1904. Operating expenses of rail lines were larger by \$5,000,000 than in 1905, but they include the charge of \$2,206,610 as a reserve fund for future maintenance and renewals under the two maintenance accounts, a charge which was not made in the previous year. Net earnings were \$32,000,000, against just under \$29,000,000 in 1905, a gain of over \$3,000,000 for the year, even after this new charge of \$2,200,000 for future maintenance. If this charge be deducted from net income instead of from gross earnings, net earnings for the year are larger by over \$5,250,000 than in 1905.

Owing to the increasing importance of income from investments and the distinction made between the two parts of the dividend payments, the income other than from transportation operations is not dealt with in this year's income account until after dividend payments on railroad operations have been deducted from net income. In this way the two principal sides of the company's operations are to a certain degree separated and therefore presented more clearly. In the condensed table at the close of this article, however, the net income is treated as is regularly done in reviews of annual reports in the *Railroad Gazette*, that is, as being the surplus remaining from the total receipts from both transportation and investment operations after all taxes and fixed charges.

Considering the income account as is done in the report, the surplus (not including income from investments) after payment of fixed charges was \$21,400,000. Deducting from this a dividend of 6 per cent. (but no more) on the common stock, there was a surplus after railroad dividends of \$5,800,000. Income from investments was \$10,300,000, from which was deducted \$3,900,000 necessary to cover the one semi-annual payment of 2 per cent. out of the investment income which was charged during the year on Union Pacific common stock. This left \$6,400,000 to be added to the surplus after dividends, making a total surplus of \$12,200,000. From this there was appropriated \$2,700,000 for betterments and additions, \$500,000 for betterments and additions on branch lines and \$1,000,000 for new equipment, a total appropriation of \$4,200,000, as against \$2,479,000 in the previous year. The new charge direct to operating expenses already mentioned of \$2,200,000 reserve for future maintenance and renewals must also be remembered in comparing the betterment appropriations of the two years. After subtracting the \$4,200,000 for betterments from the total surplus, there was a balance of \$8,000,000 profit and loss surplus for the year, as against \$7,200,000 in 1905 and \$4,700,000 in 1904. The increase in income from investments came largely from including a semi-annual dividend of 2½ per cent. on Southern Pacific common, \$90,000,000 of which is owned by the Union Pacific. It is to be noticed that this dividend was not payable till October 1, 1906, and hence strictly should not be included in the operations of the fiscal year ended June 30, 1906. If this dividend rate is maintained in future on Southern Pacific stock it will mean an addition of \$4,500,000 annually to the Union Pacific income.

These figures are all so large and so unusual that it is difficult



Union Pacific System.

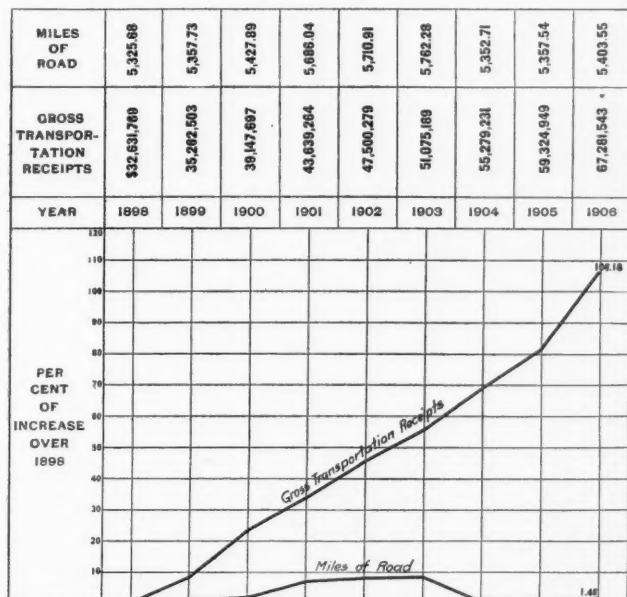
The Southern Pacific Lines west of Ogden and south of Portland are not included in the Union Pacific System.

pany for other railroads. This twofold aspect of the company was definitely recognized in the increased dividend declaration of last August, when the 5 per cent., announced as the new semi-annual payment, was officially stated to be made up of 3 per cent. from the earnings of railroad lines directly operated and 2 per cent. from income from investments. The increase in the rate thus amounted simply to the beginning of payments from the company's investments, as 6 per cent. annually was being paid already from railroad earnings.

to really grasp their true significance without careful study, but in a word, they show that consolidating the two sides of the company's operations, there was a surplus after payment of preferred dividends of \$27,782,642, or over 14 per cent. on the common stock, as against \$18,800,000, or over 11 per cent. in 1905. This takes no account of the reserve of \$2,200,000 for maintenance and renewals, \$1,240,000 net receipts from land sales, an equity estimated at over \$8,000,000 in the surplus and undistributed earnings of the Southern Pacific, or profits actually gained or which could be obtained

from the sale of stocks of the Great Northern and Northern Pacific. Including all these equities, but only the estimated profits of some \$30,000,000 from the sale of Hill stocks during the year, it is probable that the company earned last year something over 35 per cent. on its common stock. When it is considered that about ten years ago the road was in the hands of a receiver and the common stock of the reorganized company could be bought for around 15 cents a

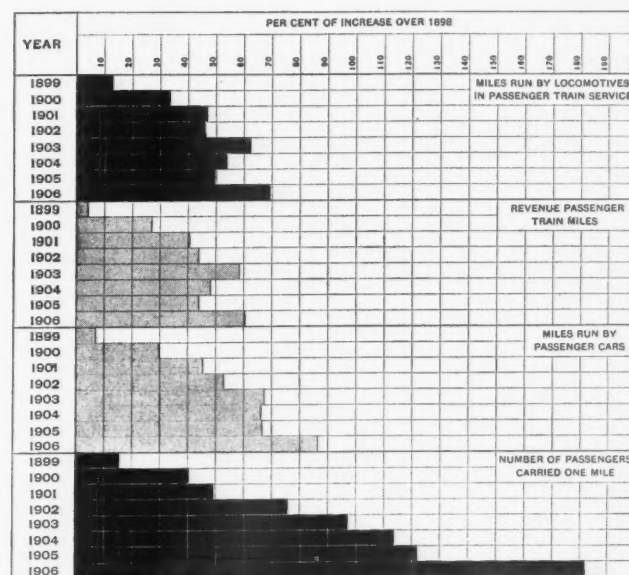
share, acquired include the Baltimore & Ohio stock sold by the Pennsylvania to Kuhn, Loeb & Co., the Union Pacific's bankers, last September, or any Chicago, Milwaukee & St. Paul stock bought in the open market or any Illinois Central holdings? The shareholders are given no definite information of the use to which these great funds were put. The strength of the company for any such campaign is shown by the fact that on June 30 the item of cash, among



Increase in Earnings and Mileage of the Union Pacific, Shown Graphically.

share it is hard to find words to express the tremendous growth of the property.

There was sold during the year \$9,960,089 par value of Great Northern stock, \$14,830,082 par of Northern Pacific and \$2,850,000 par of Northern Securities stock (not yet exchanged). The amount realized from these sales (something over \$60,000,000 at prices current during the year) was credited against the cost of stocks owned. The exact amount received may be pretty accurately judged from the decrease in the item in the balance sheet, "Stocks and bonds owned," which decreased \$62,500,000 for the year. The proceeds of these sales were "used in the construction and acquisition of new lines and in

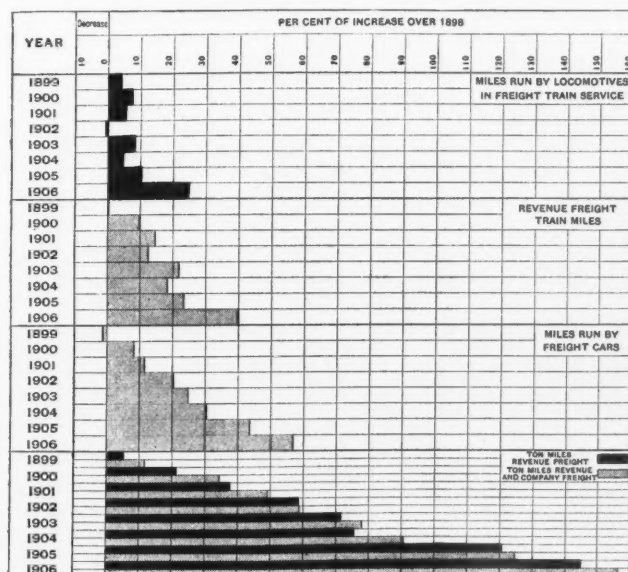


Increase of Passenger Service and Traffic; Union Pacific.

the free assets, was \$21,258,000, and demand loans, \$34,710,000, a total available working capital of \$55,968,000, against a cash item of \$7,000,000 in 1905 and \$3,500,000 in 1904.

Entirely aside from this immense cash fund there were new advances made during the year up to June 30, 1906, for construction and acquisition of new lines of \$17,500,000, against a total of such advances to date on June 30, 1905, of \$6,000,000.

The transportation side of the Union Pacific's development is exhibited graphically in the accompanying diagrams taken from the report. The first shows the increase in gross transportation receipts—which it must be remembered include no income from in-



Increase of Freight Service and Traffic; Union Pacific.

the purchase of equipment and other property; also in an increase in cash assets, which, since the close of the fiscal year, has been applied to the construction of new lines and to the acquisition of other property. The current and other free assets increased \$71,354,759 over the preceding year."

There are few more interesting conjectures than as to the facts back of this short statement. Do "new lines" and "other property"

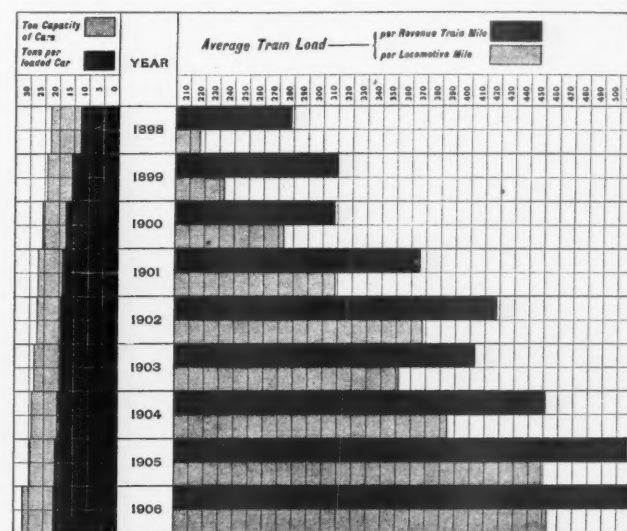


Diagram Showing Train Load, Car Capacity and Car Loading; Union Pacific.

vestments whatever—as compared with miles of road. The mileage has scarcely increased at all, while gross railroad earnings are more than as large again as in the fiscal year ended June 30, 1898, the first complete year of operation by the new company. The two following diagrams, one showing the increase in passenger and the other in freight service and traffic, combined with this diagram, are a demonstration of what has been accomplished by reduction of

grades, changes in line, heavier rails and bridges and rolling stock of greater capacity. This showing fits in well with the present discussion about car shortages and their causes and the need of more railroad mileage. It is a striking exhibit of accomplishment in carrying twice as much traffic on the same mileage by provision of better facilities. So far as a comparison between ton mileage and the amount of railroads in the country is concerned, the result is the same as though 5,000 miles of new railroad had been built. More than this it represents the most satisfactory way in which to meet new traffic demands, for it is axiomatic that additional traffic can be better handled by improvement of an existing line than by the building of an equal amount of new mileage, in which case both roads on account of thin traffic are unable to make the improvements necessary to efficient and economical operation.

The gross transportation receipts of rail lines last year increased 14 per cent.; operating expenses increased 17 per cent., and net earnings 10.6 per cent. The operating ratio was 52.41 against 51.19 in 1905. It is interesting to observe, as reflecting the heavy traffic of the year, particularly in passenger service, that there was an increase of 37 per cent. in passenger locomotive helping miles and of 12 per cent. in similar freight service, along with an increase of 12 per cent. in total passenger locomotive miles and 14 per cent. in total freight locomotive miles.

Maintenance of way and structures cost \$1,777 per mile of main and second track as against \$1,343 in 1905. The road has only 168 miles of second track, as against 105 miles in 1905. The cost of maintenance per mile was larger by 32 per cent. than in 1905. On the other hand, maintenance of equipment per locomotive cost \$3,068, against \$3,791 in 1905, a decrease of 19 per cent., and per passenger car \$1,079, against \$1,272 in 1905, a decrease of 16 per cent. Repairs and renewals per freight car increased 20 per cent. from \$103 in 1905 to \$123, a gain of \$20, which, in itself, is about half the average figure spent for this purpose on some roads. These maintenance charges are obviously all high.

The passenger density during the year increased 20 per cent. from 98,000 passengers one mile per mile of road to 119,000. There was an increase of 21 per cent. in revenue passenger miles. Freight density increased 13 per cent., from 1,062,300 ton miles (including company freight) per mile of road to 1,200,000. There was an increase of 11 per cent. in the number of revenue ton miles. The revenue trainload remained practically stationary at 510 tons, against 507 tons in 1905. The ton mile rate is not given in the report, but works out at 0.93 cents. The Great Northern's rate is 0.79 cents. The omission of this important figure from the showing of the report gives the impression that the Union Pacific is not anxious to bring up for discussion the rates which it has in force. The report takes up in some detail the new construction of the year which has already been covered in the construction columns of the *Railroad Gazette*. After summing up a number of projects, the statement is made that since the close of the fiscal year additional companies have been incorporated and that the cost of lines in course of construction and other lines projected will involve an outlay of about \$37,000,000. In addition new equipment to cost about \$13,000,000 is on order for delivery in 1907.

The following tables sum up results on the Union Pacific (including rail and water lines) for the past two years:

	1906.	1905.
Rail mileage worked.....	5,404	5,358
Passenger earnings.....	13,326,055	11,343,339
Freight earnings.....	48,992,015	42,962,258
Gross earnings.....	62,318,070	54,305,597
Maint. way and structures...	9,900,409*	7,341,905
Maint. of equipment.....	7,118,940†	6,883,676
Conducting transportation...	16,203,783	13,927,128
Operating expenses.....	35,361,171	30,370,702
Net earnings.....	22,020,372	28,954,247
Other income.....	10,329,816	6,496,759
Total income.....	42,350,188	35,451,006
Net income.....	31,764,674	22,785,507
Dividends.....	19,532,424‡	11,087,061
Appropriated for betterments.	4,200,000	4,479,165
Year's surplus.....	8,032,250	7,219,282

*\$1,691,610 charged as reserve for future maintenance, renewals, etc., in 1906.

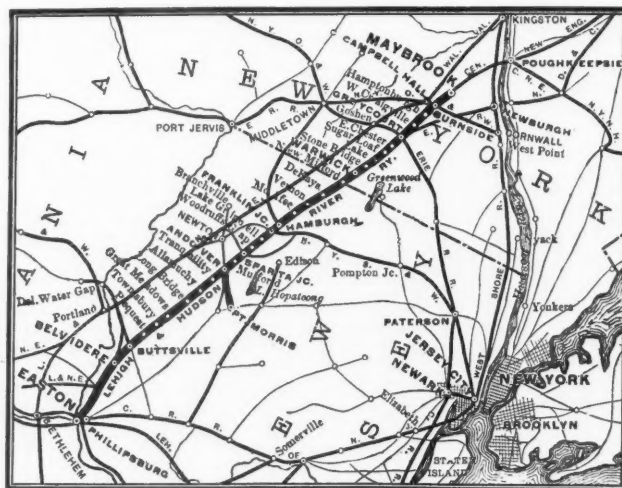
†\$515,000 charged as reserve for future maintenance, renewals, etc., in 1906.

‡Dividend requirements for a full year at the present rate will be \$23,441,982.

Lehigh & Hudson River.

The Lehigh & Hudson River is a small road controlled by a community of interests in which the Reading, Central of New Jersey, Ontario & Western, Lehigh Valley, Lackawanna, and Erie are represented, officers of each of these companies being directors of the road. It connects the eastern part of the anthracite coal territory and the slate regions near Easton, Pa., with Maybrook and Campbell Hall, N. Y., where the Central New England furnishes a connection across the Hudson River and into New England. It is a road naturally of thin traffic and small importance, but the annual report for the past year, recently issued, shows the favorable results which can come to a small company when it becomes the gateway for traffic between two important roads. By an arrangement between the Lehigh & Hudson River and the Lackawanna, the inter-

change traffic of the Lackawanna with the New York, New Haven & Hartford, was, on September 1, 1905, transferred from the Harlem River route around New York harbor to the Poughkeepsie Bridge route. This traffic is moved over the Sussex branch of the D., L. & W. from Port Morris to Andover, thence over 50 miles of the Lehigh & Hudson River to Maybrook, where it is handed over to the Central New England to be carried east and delivered directly to the New Haven system. In the 10 months of the fiscal year during which this traffic was moving there were 255,000 tons carried. Even though the Lehigh & Hudson River received so short a through haul on this traffic, the year's earnings clearly reflected the new business. It is stated in the report that it is probable that other railroad connections will soon make use of this outlet for New England business. It is worth noticing in this connection that the Lehigh & New England, which is the line on the accompanying map which parallels the Lehigh & Hudson River for its whole length, is controlled by the same interests, and that if the time ever comes when sufficient traffic moves by this route to warrant it, the two



Lehigh & Hudson River.

roads could be used as a double track line between the coal regions and the Central New England connection. In order to do this, however, it would be necessary to make considerable expenditures in improving the lines, particularly in reducing grades on the Lehigh & New England.

Gross earnings of the Lehigh & Hudson River increased 35 per cent. over 1905, being \$627,000, an increase of \$163,000 over 1905. Net earnings were \$254,000, a gain of \$83,000. Freight earnings were \$567,000, against \$400,000 in 1905, an increase of 42 per cent. The five principal groups of commodities carried were ores, anthracite coal, bituminous coal, merchandise freight and milk and cream. There was an increase in tonnage and earnings in every one of these groups, but particularly in merchandise freight, earnings from which were \$273,000, against \$165,000 in 1905. The ton mileage was over 70,000,000, as against 45,000,000 in 1905, which plainly shows the increased business.

The following table gives the principal results of operation of the Lehigh & Hudson River, excluding the Orange County Railroad, which operates 13 miles on the northern end of the line, and shows a net income for the year of \$58:

	1906.	1905.
Mileage worked.....	86	77
Passenger earnings.....	40,016	35,000
Freight earnings.....	567,189	400,450
Gross earnings.....	626,971	464,110
Operating expenses.....	372,669	292,795
Net earnings.....	254,302	171,315
Net income.....	72,492	22,023

Erie.

The Erie is a New York to Chicago trunk line, an anthracite coal road, a bituminous coal road, and a railroad with a large suburban business. It is also the typical example, financially, of a railroad company which in its earlier history was subject to the most notorious kind of bad management, a handicap which was by no means cleared away at the time of the most recent reorganization, when in 1895 the Erie Railroad succeeded the New York, Lake Erie & Western. Because the reorganization was not more drastic and comprehensive in its terms the Erie has been handicapped in developing the many and varied activities included in its various mileages. With the gradual enlargement of its credit, which has come with the general prosperity of the last 10 years, a way has been found to provide funds for important improvements to put the road in efficient condition according to modern standards, toward which a beginning had earlier been made by small appropriations

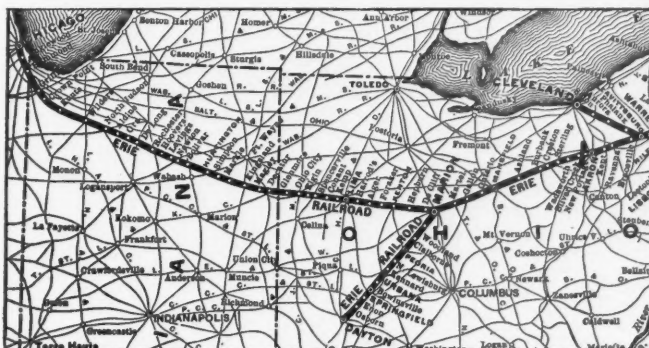
out of surplus income. This is through the sale of convertible bonds, an authorized issue of \$50,000,000 of which was made in 1903, when the first \$1,000,000 were sold. Up to June 30, 1905, \$9,000,000 more were sold and \$12,000,000 during the last fiscal year, making a total of \$22,000,000 issued on June 30, 1906. It is notable that in the 10 years since reorganization the mileage has increased only 181 miles. In a word, the great development which has been made on the Erie has been intensive rather than extensive, except for the important purchase of the Pennsylvania Coal Company in 1901—the improvement of the transportation plant rather than the building or buying of new railroad lines.

Owing to the funds available from sales of convertible bonds last year saw improvement work carried on to an unusually large extent, and plans more or less definitely determined on for the future are even more far reaching. The principal work already begun is improvement of shops, purchase of equipment and improvement of the line, the last including the beginning of work on electrification of a 35-mile suburban line out of Rochester, N. Y. The shop arrangements of the whole road have been reorganized with headquarters at certain strategic points, where shops and equipment of the most modern sort have been installed. For example, in another column will be found a description of the new electric equipment of the Erie shops at Hornell (Hornellsville), N. Y., the junction point of the Buffalo division and the main line west. The new equipment which has been added, particularly the locomotives, of which there were 118 additional numbers received during the year, besides 55 more new engines to fill places of a like number of worn out light locomotives put out of service, is much of it of the finest sort. The Erie already has some very large passenger locomotives in service, and with delivery in 1907 of three Mallet compounds, will have the largest freight engines in the world.

Reduction of grades and curvature, so as to cheapen expense of

is in progress. A low-grade single-track cut-off is being built from Cuba to Hunts, on the Buffalo division, 33 miles. These new lines are also shown on the accompanying map. Improvement of grades and alinement of the Buffalo division between Hunts and Hornell, 26 miles, has been authorized. Present grades between Hornell and Salamanca will be reduced from 1.07 per cent. east and 1.25 per cent. westbound to 0.2 per cent. east and 0.3 per cent. westbound, and, with two exceptions, maximum curvature from 4 to 1½ deg., with a saving of 1,014 deg. of central angle. These important improvements to the line already authorized or under way give an idea of the general policy, which, it appears, can be expected to be in force on the Erie in the future. It is a large task to bring about such general improvement of the whole property, but a strong beginning has been made, and it is entirely probable that before many years the road will be able to make a much larger profit than now on its through traffic, through reduced cost of operating expenses as a result of such improvements.

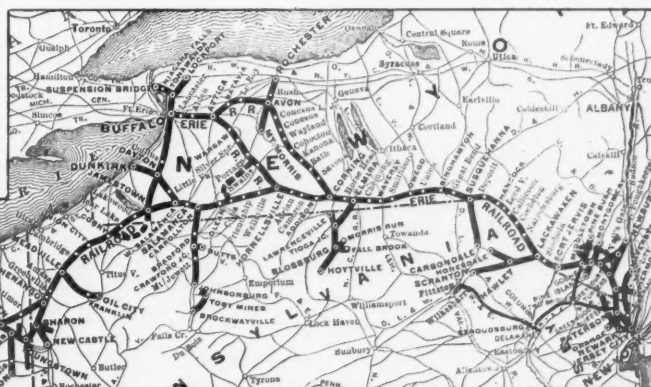
Gross earnings, including earnings from other than railroad operations, that is, by water routes, shipping and coal storage plants and elevators, stock yards, etc., were just over \$50,000,000, an increase of \$4,278,000, or 9 per cent. Leaving out results of the other operations, gross railroad earnings were nearly \$47,500,000, an increase of not quite 10 per cent. Net railroad earnings were \$15,-



Erie Railroad.

operation for through freight, is the road's most serious problem, both in its size and the long time which will be necessary to carry it through to a satisfactory conclusion. It is the plan to have a low grade line all the way between Jersey City and Chicago. This is being taken up in two parts, the first part from Jersey City to Port Jervis, a region of particularly bad grades at present; the second, between Port Jervis and Chicago. There is to be an entirely new line for about 70 of the 89 miles between Jersey City and Port Jervis. The first part of this, from Guymard, eight miles east of Port Jervis, east to Highland Mills on the Newburg branch, 42 miles, is shown on the accompanying map. On this section work has been under way during the year. To follow this, construction of a new and better line from Highland Mills south to Passaic Junction, which is about 12 miles out of Jersey City, has been authorized. When these lines are built, they will reduce the present maximum grades between Jersey City and Port Jervis from 1.25 per cent. east and westbound to 0.2 per cent. east and 0.6 per cent. westbound, except for a helper grade westbound from Port Jervis to Guymard, eight miles. They will also do away with 1,329 deg. of central angle of curvature, making, with some exceptions, 1½ deg. the maximum curve. As a result, it is expected that the trainload can be increased by 63 per cent. eastbound and by 83 per cent. westbound. Another large betterment which is being planned on this end of the line is a general reorganization and improvement of the Jersey City terminal, plans for which will probably be announced next year.

Between Port Jervis and Chicago the general plan is to eventually obtain a maximum grade not exceeding 0.3 per cent. east and westbound. A single-track line from Columbus, Pa., to Niobe, and a low grade double-track line from Niobe, Pa., to Lakewood, N. Y., in all 23 miles, are now being built. This will reduce the present grade of 0.75 per cent. east and 1.09 per cent. westbound to 0.2 east and 0.3 westbound, and maximum curvature, with one exception, from 3 deg. 40 min. to 1½ degrees. Double-tracking and correction of grades and alinement of the existing road between Salamanca, N. Y., on the Allegheny division, and Cuba, 28 miles,



400,000, an increase of 13 per cent. over 1905. Maintenance of way expense increased over \$1,000,000, or 29 per cent., over the previous year, which is largely accounted for by 73 bridges replaced, 32,938 tons of 90-lb. and 2,405 tons of 80-lb. rail placed in track and 191 miles of track fully and 51 miles partially ballasted, together with exceptionally large charges to roadway operating expenses in connection with improvements at roundhouses and shops. The increase in this account is all reflected in the unit charge for maintenance of way per mile, as there has been no increase during the year in average mileage operated. This was \$2,139 in 1906 against \$1,652 in 1905.

Maintenance of equipment cost also increased a little over \$1,000,000, which is more by 14 per cent. than in the previous year. There was a large increase in the item, repairs and renewals of freight cars, which is stated to be partly due to the fact that the largely increased traffic made it desirable to put a number of old light capacity freight cars into serviceable condition, whose use, in trains with new and heavier equipment, required extraordinary expenditures for maintenance. The shop improvement is also reflected in this account in the increase of \$111,110, or over 70 per cent. in the item, repairs and renewals of shop machinery and tools. The unit maintenance of equipment charges, including repairs and renewals and value of equipment destroyed or sold, which amounts to a small additional charge for renewals in each case, were, per locomotive \$2,954 against \$3,080 in 1905, per passenger car \$618 against \$582 in 1905, and per freight car \$60 against \$47 in 1905.

With an increase of 5 per cent. in the number of passenger miles and 15 per cent. in the number of ton-miles, conducting transportation cost rose by only \$100,358, or 0.61 per cent. over the previous year, a fine showing. Revenue per freight train mile was \$2.72 as compared with \$2.57 the previous year, an increase of 6 per cent. The revenue trainload increased from 412 tons in 1905 to 455 tons, or 10 per cent. Including company freight the trainload was 484 tons against 441 tons in 1905. The average carload rose from 17.70 tons in 1905 to 18.75 tons, or 6 per cent.

Of the tonnage of revenue freight carried, anthracite coal and bituminous coal each furnished 20 per cent.; coke, 6 per cent.; iron and other ores, 5 per cent., and stone, sand, etc., 3 per cent., showing that over 55 per cent. of the company's tonnage is in these heavy products. Owing to the strike in both the anthracite and bituminous regions, there was a decrease in both classes of coal tonnage, each of which furnished 22 per cent. of the traffic in 1905. Of the other tonnage in 1906, grain made up 3 per cent., merchandise 8 per cent., and articles not classified 12 per cent.

The principal results of the last two years' operations of the

Erie Railroad Company, except the New Jersey & New York Railroad and the coal companies, are as follows:

	1906.	1905.
Mileage worked	2,151	2,151
Passenger earnings	\$8,982,811	\$8,397,368
Coal freight earnings	12,049,493	11,628,376
Mdse freight earnings	23,506,444	20,555,003
Gross railroad earnings	47,461,402	43,321,647
Maint. way and structures	4,600,230	3,553,410
Maint. of equipment	8,677,904	7,595,751
Conducting transportation:		
Operation	16,644,723	16,544,365
Traffic	904,771	912,124
Railroad operating expenses	32,059,130	29,722,190
Railroad net earnings	15,402,272	13,599,457
Net income	5,016,644	4,406,596
Appropriated for improvements*	1,926,973	1,360,555
Year's surplus	533,975	490,344

CONTRIBUTIONS

An Oversight.

Baltimore, Md., Dec. 10, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Was it not an oversight in omitting the names of Mr. Charles D. Fisher and Mr. Frank T. Redwood, both of Baltimore, who were

The North Platte River Bridge of the Union Pacific.

Bridge No. 193 of the Union Pacific, over the North Platte river, 289 miles west of Omaha, which was recently rebuilt, is the third bridge to be built at this point since the construction of the line. The original structure was a pile trestle with planked deck and was used for highway traffic as well as for trains. It was replaced in 1887 by an ordinary pile trestle 2,101 ft. long with 16-ft. spans. There were six oak piles to the bent, four of which carried the track and the other two supported an ice breaker. The width of the river at this point varies from 2,000 to 2,500 ft., and like all such streams in this region, is comparatively shallow, with sandy bottom and low banks. The view looking down on the top of the new bridge shows the condition of the river at low water. Most of the bed is exposed and the numerous small shifting water channels existing at such times can be plainly seen.

The second bridge was strengthened from time to time as the loadings and traffic volume increased, but for three or four years prior to replacement it became increasingly difficult to maintain it in proper condition to carry the traffic, and train speeds were limited to 20 m.p.h. over it. The piling, which had been in service since 1887—a good record for this region—was failing, making it difficult to keep the structure in line, especially when the ice moved



North Platte River Bridge of the Union Pacific.

also killed with Mr. Samuel Spencer and Gen. Philip Schuyler in the recent Southern Railway accident recorded in the *Railroad Gazette*, Dec. 7th? Messrs. Fisher and Redwood were also Mr. Spencer's guests.

READER.

Block Signals Required in Massachusetts.

The Railroad Commission of Massachusetts acting under the law passed by the last legislature* has issued to the railroads a circular setting forth its purpose to require block signals throughout the state. The circular says:

"The ultimate end to be secured is the installation of some approved form of block signals upon all steam railroad lines within the state at as early a day as may be practicable. This means a substantial outlay by railroad companies in the immediate future.

"The order in which block signals should in the future be installed must have reference to both amount of traffic and physical conditions. Of first importance is the equipment of lines of railroads embracing two or more tracks, or presenting the conditions of a single track carrying a large amount of traffic and involving heavy grades and sharp curves. Local conditions may, of course, demand at particular places early equipment out of the usual order.

"Companies are requested to submit to the board on or before December 15 a brief description of the block signals now in use upon their several lines within the state, together with an explanation of such action as has been taken in either actually equipping these lines or in making arrangement for their future equipment with block signals since January 1, 1906."

The pipe line from the wells on the Caspian at Baku to the Black Sea at Batum has been but recently completed, although it was begun about ten years ago. For a long time it extended only 140 miles eastward from Batum, the oil being collected from the wells at Baku by local pipe lines and delivered to tank cars on the railroad at stations close by, hauled thence some 400 miles and then transferred to the great pipe line for conveyance to Batum. The line is now about 550 miles long, and is estimated to be capable of passing about 400,000,000 gallons of oil yearly (1,440,000 tons), which is about twice as much as the quantity which it is expected to use at present. This must release a great number of cars, which are often badly needed on other routes.

*"The Board of Railroad Commissioners may from time to time require railroad companies to install and maintain at such places upon the railroad premises as it shall designate such block or other signals or devices as it shall approve for the purpose of safeguarding public travel. The supreme judicial court shall have jurisdiction in equity to enforce compliance with any order issued by the board."



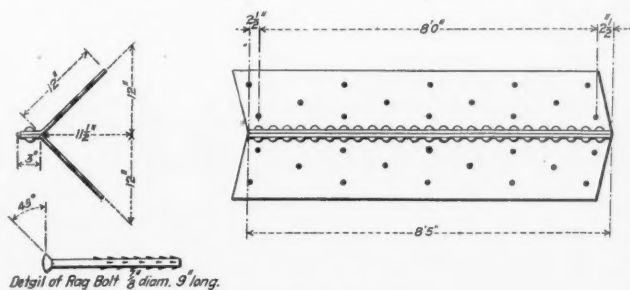
View of North Platte River Bridge.

to resist the action of the ice. The center line of the new bridge was located 16½ ft. north of the similar line of the old bridge; this permitted it to be built without disturbance to traffic. A line change of about three-quarters of a mile each way from the bridge was necessitated by this change of location, and the grade was also raised 4 ft. to give about the same clearance below the girders as existed below the old bridge. Through girders would have required less lift in the grade than deck girders, but future double-tracking was considered in making the plans, and as now arranged,

will only require extending the piers and setting on another row of deck girders without disturbing the present bridge.

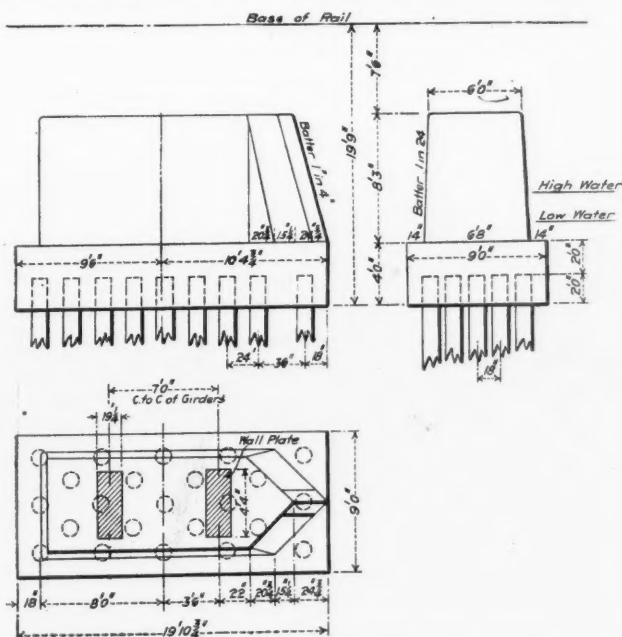
Work was to have begun on the new bridge in August, 1905, when the water was lowest, but delays in receipt of equipment held up the work until the middle of November, so that practically all of the foundation work was done during the winter months. Last winter was unusually mild, enabling the concrete work to be done without freezing, but this advantage of the mild weather was overbalanced by troubles of another sort that it caused. The ice, instead of remaining solid and stationary, was continually breaking up and gorging against the work, causing shifting and changes of depth in the channels, washing out the sheet piling and necessitating frequent rebuilding of the cofferdams. It often happened that an entire day's work would be undone over night in this way. Difficulty was also experienced in maintaining a sufficient labor force. As a result of these delays, the pier work was not completed when the spring rise in the river came, and the last four piers were built in from 8 to 13 ft. of swift water and running ice.

There were 960 pieces of piling driven, the average penetration being 16 ft. below foundation bottom, through sand to hard-pan or rock. The piles were sunk with the aid of a water jet, a special plant having been bought for the purpose. This plant was set up in the river bed and the water piped each way to the work through a 4-in. main. A pressure of 250 lbs. per square inch was used,



Steel Nose Plate for Piers.

sinking the piles quickly through the sand. The piers and abutments contain 2,532 yds. of concrete and there are 730 tons of metal in the superstructure. The total excavation was 3,300 cu. yds. The plate girder spans were received riveted up and were unloaded directly on the piers by the self-propelling derrick car which has



Details of Piers for North Platte River Bridge.

been referred to previously in these columns in connection with Union Pacific bridge work. This car stood on the old bridge.

An interesting feature of the work was in connection with the instrument work in locating the piers. The instrument man of the small engineering party constantly on hand for this special purpose was required to supervise the setting of all forms and have them in exact position and the concrete was carried up and finished to surface under his observation, the result being that the work checked to $\frac{2}{100}$ of a foot in this respect. For longitudinal

location the conditions made it difficult to obtain accurate results. Measurements had to be preserved on the deck of the old bridge, as the moving ice prevented placing points in the river bottom. But as the result of a bad case of creeping rails which had always existed over this bridge, its deck was constantly subject to more or less movement, necessitating repeated checking of the pier centers, and verification of instrument points before final setting of each form. However, the completion of the work disclosed a total error of only $\frac{5}{8}$ in. in the total bridge length of more than 2,000 ft., and it was easily absorbed in spacing the girders on the piers.

The steel work was furnished by the American Bridge Company, and erection was done by the railroad company, Mr. R. L. Huntley, Chief Engineer. Mr. J. H. Howe was Resident Engineer in charge of the work, and the instrument work was under the supervision of W. H. Larson, Assistant Engineer. The bridge was opened to service last summer.

Transportation and Car Accounting Officers.

The Association of Transportation and Car Accounting Officers, of which T. S. Bell, of the Pennsylvania, is President, and G. P. Conard, of New York City, Secretary, held its regular meeting at New Orleans, November 21 and 22, with a fair attendance. The address of welcome was by Judge T. J. Freeman, Solicitor of the Texas & Pacific.

Judge Freeman spoke, as he put it, "from the standpoint of a layman," but before he had gone far the members concluded that he was a pretty good transportation man. Judge Freeman called attention to the present congestion of traffic, and advocated pooling of cars, the restriction of "transit privileges," such as compression and concentrating of cotton in transit, and milling in transit, and would make shippers increase their facilities for prompt handling of freight. He offered a scathing criticism of what he aptly called the "mathematical tonnage system," and said that it should give place to a "speed tonnage system." The Judge favors a systematic courting of favorable public opinion of railroads, and suggested that the people should be educated through good treatment in small as well as large matters to consider the railroads as their friends instead of enemies.

The Executive Committee reported the addition of 18 active, one associate and two honorary members since the last meeting, and the total number of roads now in active membership is 191, holding 275 memberships. These roads work 207,912 miles and own 1,997,780 cars. Seventy-eight fast freight lines are affiliated with the association.

The Committee on Car Service reported that it had formulated and recommended to the American Railway Association a set of rules to control and restrict diversion of cars. These rules were approved as follows:

These rules are founded on the following principles:

That the owner has a right to demand that his cars shall be kept moving in a homeward direction.

That the marks of ownership on a car are a sufficient guide to insure its movement toward the owning road.

That the intent of these rules is to make railroads responsible for keeping foreign cars moving toward the home road and to prohibit them from sending a foreign car in an opposite direction if in serviceable condition, except as hereinafter provided for.

IF LOADED.—Foreign cars must be handled as follows:

1. Loaded to or via the home road by any route.
2. Loaded to the road from which originally received if such loading is in the direction of the home road, but not otherwise.
3. Loaded to an intermediate road in the direction of the home road.
4. Loaded in local service in the direction of any junction point with the home road. After being released from such loading car must be sent to the home road loaded or empty.
5. Loaded in the direction of any junction point with the road received from, if such loading is in the direction of the home road, but not otherwise.
6. Cars may be loaded locally in an opposite direction from the home road or home route if they are immediately thereafter to be loaded according to Rules 1, 2 or 3.
7. Cars may be reconsigned to connecting road in an opposite direction from home only when permission to reassign is obtained from the car owner.

IF EMPTY.—Foreign cars must be handled as follows:

8. Empty cars belonging to direct connections must be returned to the owners regardless of whence they came or in what service they were received, except as provided in Rule 13.
9. Empty cars may be sent in an opposite direction from the home road or home route if to be loaded according to Rules 1, 2 or 3.
10. Empty cars may be delivered to connecting road to be loaded in accordance with Rules 1, 2 or 3, but not otherwise.
11. Empty cars belonging to indirect connections must be returned to the road received from if that is in the direction of the home road, but not otherwise.
12. If a road has an empty car that cannot be disposed of according to the foregoing, it must be reported to the owner and disposition arranged for.
13. Owners shall have the right to demand that special equipment, such as refrigerators, coal, coke and stock cars and other special cars, which

cannot be loaded in both directions as a general proposition, shall be returned to the junction point at which delivery was made.

CARS IN SWITCHING SERVICE.—

14. Cars handled in switching service, whether by railroads or by switching roads, shall be subject to these rules.

The committee's recommendations that the penalty for diversion be \$2; that diversions be reported within two months to the owner, and that failure to thus report be penalized in the sum of \$10 were not approved by the meeting.

The Committee on Per Diem reported its interpretations and conclusions on the application of double reclaim in a territory where there is no local agreement to the contrary; on the necessity of giving advice to all roads over which a car is to move on M. C. B. home-route card; on reclaims to be made covering per diem accruing on cars not accompanied or preceded by proper data for forwarding; on adjustment of controversies arising in connection with errors in penalty notices; on how to establish the date of delivery of a car, by a road which does not pay per diem, to a per diem road; and on the reporting of receipts as well as deliveries on junction cards.

The Committee on Office Methods and Accounting reported concerning the project for uniform standard abbreviations for car initials; that in order to avoid confusion no abbreviation of initials should be used on billing, car reporting or for other purposes. Its recommendation that claims for unreported per diem be held back three months so as to give debtors time to make supplementary reports was not adopted.

The Committee on Conducting Transportation reported on the best means of facilitating the movement of cars through yards, and embodied in its reports samples of forms of blanks that have been used with success for daily records. One of these is for a record of cars received and forwarded for 24 hours, and another for a record of shop cars for 24 hours.

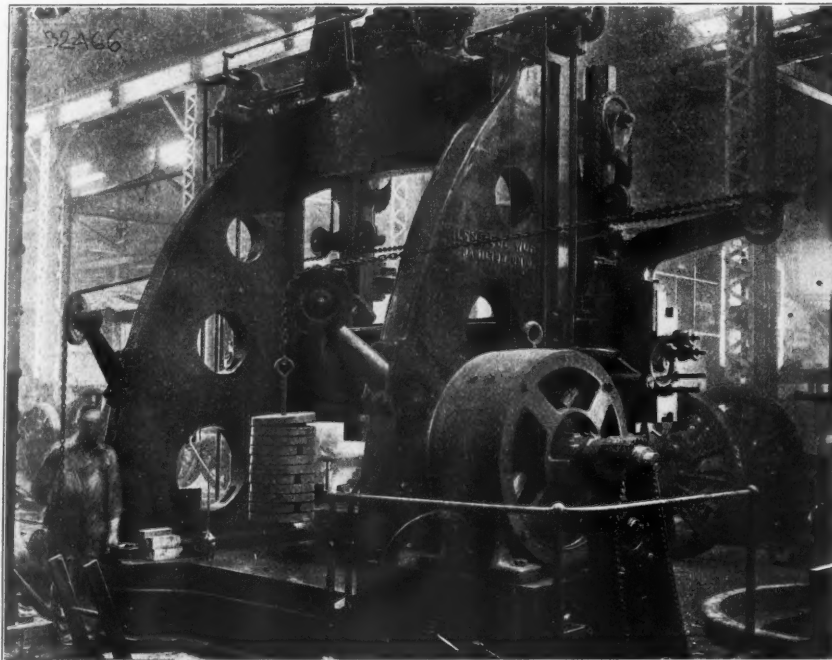
The daily reports are to be kept in a loose leaf binder and are subject to inspection by the yard master, or his representative, at intervals during the day, being abstracted from the binder and forwarded by the yardmaster to the Superintendent of Transportation at the close of the day's business. As the entry is made of the leaving time of each car, a blue pencil mark is drawn through the car number to indicate that it has been disposed of. Shop cars, or cars abnormally delayed, are transferred to the next day's sheets, the total time in yard being shown when each car is disposed of, and entering into the average for the day on which car is released, shop delay being entered as a separate item.

The Japanese Government, according to reports from Tokio, has decided to build a bridge over the Yalu river at Yon-jen-Pho to have a span of 3,239 ft., and to cost about \$2,000,000. The bridge will be a part of the Wi-Ju-Mukden Railroad, which will provide direct communication between Mukden and Fu-San.

Electrical Equipment of the Erie Shops at Hornell, N. Y.

The Hornell shops of the Erie have recently been enlarged and equipped with electric drive throughout. New buildings have been built, additions made to old buildings, a new power house erected and a large number of new machine tools installed. This installation is an interesting and instructive illustration of the latest engineering practice for a railroad shop where the largest proportion of power is required at short distances from the power house and a large proportion of variable speed and crane load is required.

A careful comparison was made of the advantages and disadvantages



90-in. Boring Mill Driven by Two Motors—Erie Shops at Hornell.

of the alternating-current and direct-current types of apparatus for the service contemplated. It was decided that present conditions do not justify the installation of both types of motors, although it appeared probable that at some time in the future an equipment of this nature would be necessary. Under the conditions existing at Hornell it is apparent that all of the motors are located well within the limits of 220 volts distribution, so it was finally decided to install only direct-current apparatus, excepting a small generator set which is used to supply current for the present yard and depot lights. The enlargement of the power house at some future time has been provided for, but the type of apparatus to be placed in the engine room will be determined upon at the time of making the addition, as the present system can readily be expanded in either of two ways. Additional power can be ob-

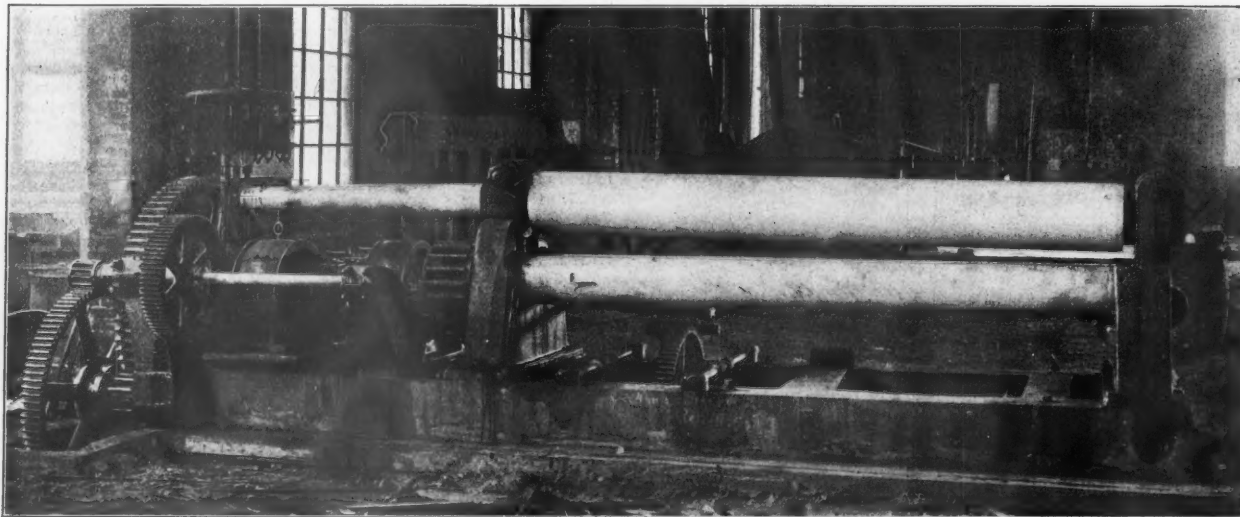
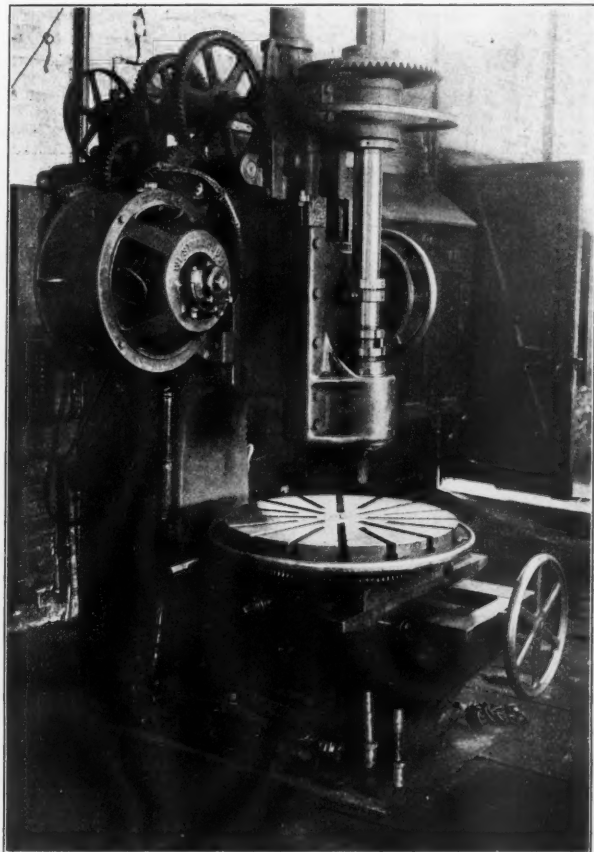


Plate Rolls Driven by Two Motors—Erie Shops at Hornell.

tained by installing either an alternating-current generator which would supply the lines direct, the present motor generator set acting as a tie between the present units and the future one, or a direct-current generator, with the necessary transforming apparatus for alternating-current.

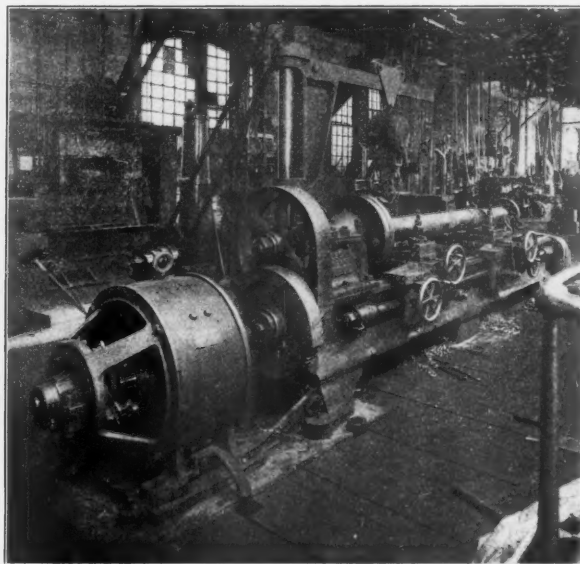
The power house is a large brick fireproof structure, with con-



Vertical Miller—Erie Shops at Hornell.

crete roof and flooring, and has ample provision for light and ventilation. Foundations are in place for ultimately doubling the boiler capacity so that it is only necessary to erect the additional units. The boiler plant consists of four Babcock & Wilcox units of 400 h.p., operating at 150 lbs. pressure and equipped with chain grates. All live steam mains are provided with the Holley drip system.

The coal is conveyed automatically from the time it is dumped from the cars until it is fed into the furnace. It passes from the car into a chute which empties into a crusher, and is then conveyed by an endless belt to the top of the power house, where it passes through another chute to the second conveyor that distributes it in the bunkers over the boiler room. From there the coal passes through chutes to hoppers in front of the furnaces, where it is fed into the chain grates. The conveyors, which were made by the Exeter Machine Company, have a capacity of 60 tons per hour, and are operated by a 10 h.p. and a 13½ h.p. Westinghouse type S motor. The coal crusher is operated by a 20 h.p. type S motor. The generating equipment consists of three Ball & Wood cross compound, high-speed condensing engines, two of 500 h.p. each, direct-connected to a Westinghouse 300-k.w., direct-current, 250-volt, three-wire generator running at 150 r.p.m., and one of 400 h.p. direct-connected to a similar generator of 200 k.w. capacity operating at 200 r.p.m. The engines run condensing except in cold weather, when the exhaust steam is used in heating the shops. Besides the generating equipment and pumps there are two Inger-



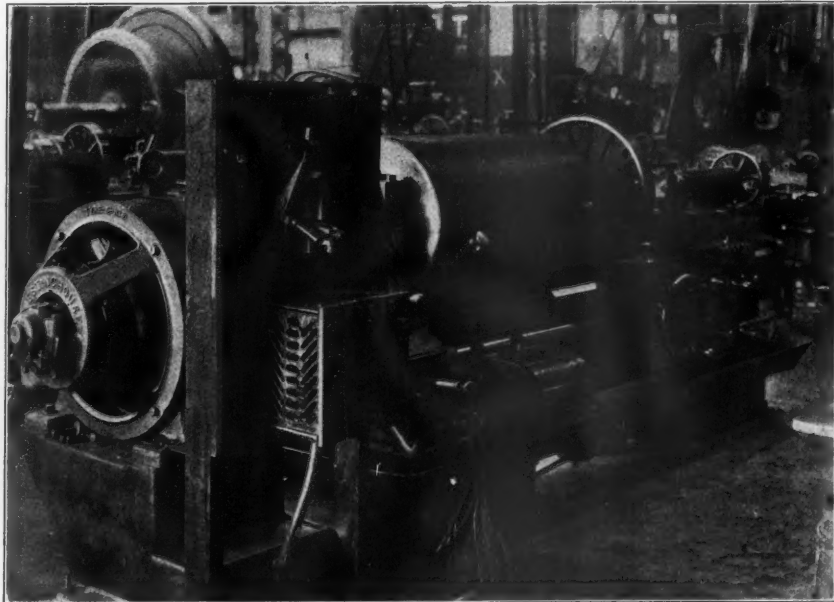
Niles Lathe Direct Connected to Motor—Erie Shops at Hornell.

soll-Sergeant compound air compressors that furnish compressed air to the pneumatic hammers in the shops.

Current is transmitted by cables through a large tunnel to the new erecting shop and thence through underground conduits to the buildings. The Westinghouse three-wire system of distribution is used for lighting and power, with an electromotive force of 250 volts between outside wires and 125 volts between each outside wire and neutral. Incandescent and Cooper-Hewitt lamps are operated on the 125-volt sides of the system and constant-speed, 250-volt motors are connected to the main or outside wires, while the variable speed motors use shunt field control.

The old erecting shop uses both group and individual drive, the group-driven machines being divided into five sections and operated by five type S constant speed motors, two of 30-h.p. capacity and three of 50-h.p. capacity. The machines in the fitting shop, which occupies one wing of the erecting shop, are also group-driven by a Westinghouse 30-h.p., constant speed, type S motor. The accompanying photographs show some of the heavier tools. The Niles 90-in. boring mill is driven by one type S 20-h.p. and one 7½-h.p. variable speed motor. A type S 20 h.p. is direct-connected to a Niles lathe. The crank pin lathe shown herewith is driven by a 7½-h.p. type S motor; the controlling apparatus is shown in the photograph. The plate rolls are driven by two motors of 10 h.p., and 15 h.p., and the vertical miller is operated by a 7½-h.p. motor.

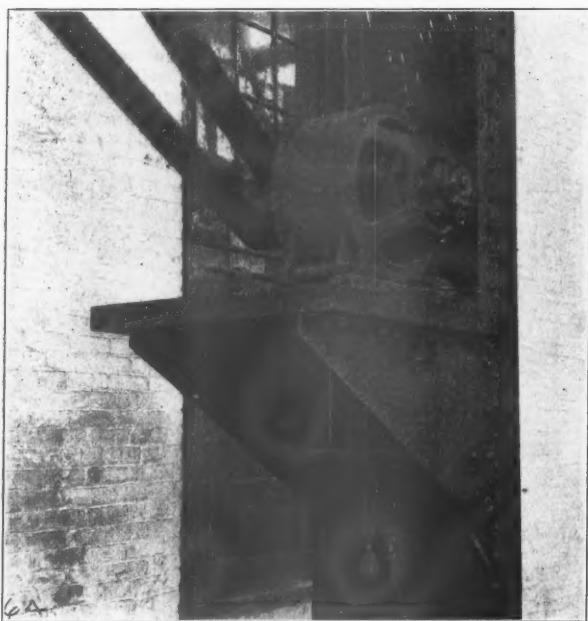
The speed of these motors is controlled by varying the field strength. This may be done while the machine is in operation, and



Crank Pin Lathe—Erie Shops at Hornell.

the controller is conveniently placed within the reach of the operator. Resistance is placed in the shunt field circuit of the motor, which decreases the shunt field current and causes a decrease in the field strength and an increase in speed; this is a simple and effective means of varying the speed of either a shunt or a compound-wound motor. The horse-power output remains nearly constant throughout the whole speed range.

Group drive is used for the smaller machines. One of the photographs shows a $7\frac{1}{2}$ h.p. motor which drives a group of machines in the new boiler shop. In connection with the boiler shop equipment is a flue rattler located outside the building and operated by a 20 h.p., type S motor. It is 48 in. in diameter and 22 ft. long,



Motor Driving a Group of Small Machines—Erie Shops at Hornell.

and has a capacity of from 175 to 200 flues. An average of five lots per day are cleaned, the exact time for each rattling depending upon the water used in the boilers. The longest flue is 21 ft., and the diameter varies from $1\frac{1}{2}$ in. to $2\frac{1}{2}$ in.

The new equipment was installed by Westinghouse, Church, Kerr & Co.

November Railroad Law.

The following abstracts cover the principal decisions in railroad law by the United States Supreme Court and the Federal courts during November:

Interstate Commerce Commission findings.—Under the provision of the Interstate Commerce Act that the findings of the commission shall thereafter be deemed *prima facie* evidence as to the facts found in all judicial proceedings, a railroad company seeking to restrain the enforcement of a re-classification has the burden of showing that the facts on which the commission acted were not as found by it. *Interstate Commerce Commission v. Cincinnati, Hamilton & Dayton Ry. Co.*, 146 Federal Rep. 559.

Contract to develop traffic.—A contract to develop the milk traffic of a railroad for a percentage of the freights earned—the rates not to exceed those charged by competitive lines—is not contrary to public policy nor in violation of the anti-trust act, or the Interstate Commerce Act, and cannot be abrogated by the railroad company, though it granted the person an exclusive privilege in the business over the railroad, but subject to the proviso that it was exclusive only “so far as it was permitted to do so by law.” *Delaware, Lackawanna & Western Railroad Co. v. Kutter*, 147 Federal Rep. 52.

Local attachment of cars belonging to non-resident railroad company.—Cars belonging to a railroad company and delivered to other companies, loaded with freight for transportation into other states and to be returned within a reasonable time either loaded or empty, are until their return engaged in interstate commerce and such cars are not subject to attachment under the laws of a state into which they may be carried by the

connecting carriers. *Davis v. Cleveland, Cincinnati, Chicago & St. Louis Railroad Co.*, 146 Federal Rep. 403.

Passenger thrown from platform by motion of car.—A passenger boarding a car at a station where no agent was maintained and required to enter the baggage car to have his baggage checked, after which it is his duty to return to the car set apart for passengers, is entitled to recover for injuries caused by being thrown from the platform by the motion of the car while so returning, and using due care for his safety, and this more particularly where the car platform gates are allowed to remain open while the brakeman charged with the duty of closing them is otherwise occupied. *Boston & Maine Railroad Co. v. Stockwell*, 146 Federal Rep. 505.

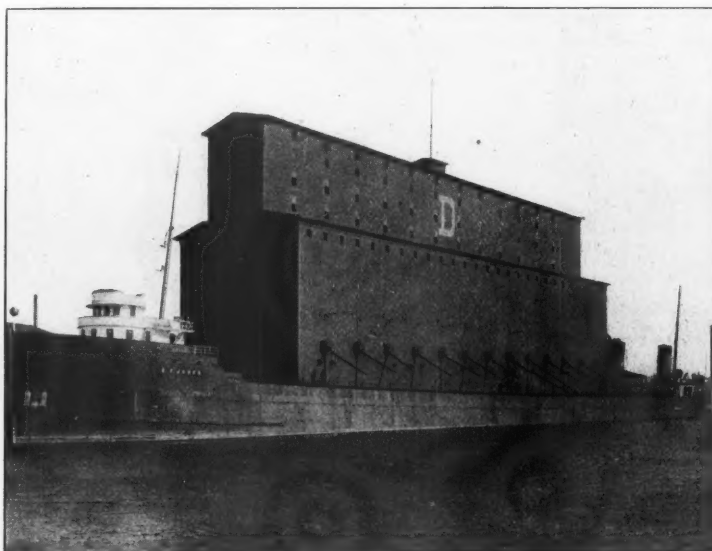
Condition of spark arrester.—In a case where the railroad company sued for setting out fires claimed that its spark arrester of approved make was in good order, it was held allowable to show in rebuttal of this claim that on the same day this engine set out ten fires within two miles of the fire in question, and that a spark arrester making this record was not in good condition. *Toledo, St. Louis & Western Railroad Co. v. Star Flouring Mills Co.*, 146 Federal Rep. 953.

Speed of trains.—The fact that a railroad train is run over a crossing at a rate in violation of a city ordinance does not show negligence conclusively, but is to be considered by the jury merely as a circumstance from which negligence may be inferred. *Erie Railroad Co. v. Farrell*, 147 Federal Rep. 220.

Crossing railroad tracks.—A street railroad having obtained a right to lay its tracks in a street cannot be enjoined from crossing the tracks of a railroad which cross the street. The steam railroad has no right in the street except subject to such proper use of it for street purposes as may be authorized by the city itself. *Pennsylvania Company v. Lake Erie, B. & N. Railway Co.*, 146 Federal Rep. 446.

Fast Loading of Grain Steamers.

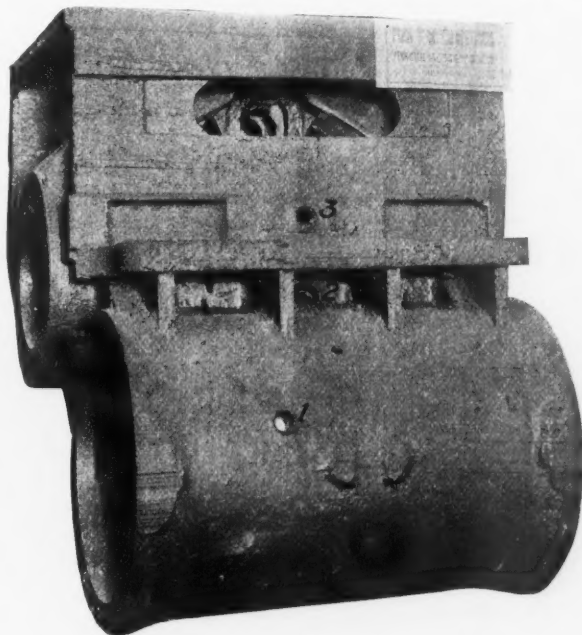
During a temporary lull in the ore trade this fall a number of the large lake steamers which normally are employed entirely in the ore business, have turned their attention to the grain trade and have made some surprisingly fast records in loading and unloading. The best loading record was made by the steamer W. D. Matthews at elevator B of the Canadian Pacific at Fort William, when 198,000 bushels of wheat were put on board in 1 hr. and 57 min., or at the rate of 1,659 bushels a minute. The best previous record was made on the steamer James Laughlin by the Great Northern elevator at Duluth, when part of the cargo was loaded at the rate of 1,300 bushels a minute. The accompanying photograph shows the method of loading grain, and explains somewhat how such tremendous speed is possible. It shows the steamer B. F. Jones loading a cargo of 370,373 bushels at Duluth. In unloading this same cargo at Buffalo, elevating of the grain was begun at 7 o'clock Monday morning at the Mutual elevator and by 4 o'clock 227,000 bushels had been discharged. The steamer then went to the Niagara elevator, beginning work at 7 o'clock Tuesday morning and at 9 o'clock Tuesday night had discharged 143,000 bushels, making 370,373 bushels unloaded in 22 hours working time. These figures make clear one of the principal reasons why steamer rates on a commodity like grain which can be carried in bulk are inherently cheaper than rates by rail.



Steamer “B. F. Jones” Loading 370,000 Bushels of Grain at Duluth.

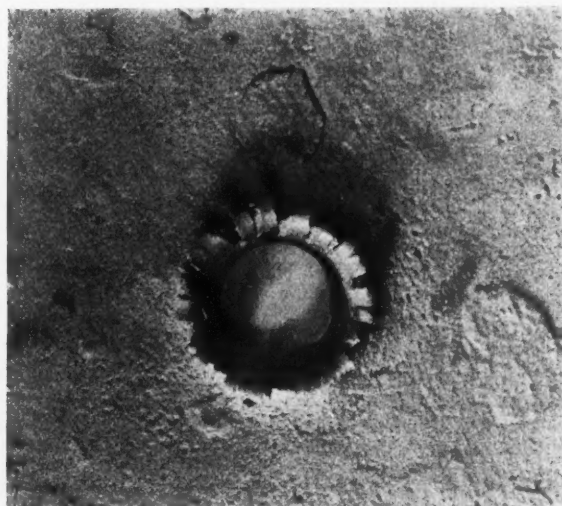
Ballistic Test of Cast-Steel Cylinders.

Some time ago the Penn Steel Casting & Machine Co., of Chester, Pa., made some cast-steel locomotive cylinders for the New York Central, which were illustrated in the *Railroad Gazette* for April 20, 1906. As noted at the time, the metal of which these cylinders were made had a tensile strength of 73,600 lbs. per sq. in. of section with an elongation of 29 per cent. Since the publica-



Cast Steel Cylinder, Showing Points of Impact in Ballistic Test.

tion of this description another similar cylinder has been cast and subjected to a rather novel test. It was sent to the United States ordnance proving ground at Indian Head and subjected to a ballistic test after the manner of armor plate. This was done ostensibly to ascertain the resistance of the material, though it could hardly be expected that the metal would serve as an efficient protection against the impact to which it was subjected. In all three shots were fired with the casting set at about 15 ft. from the muzzle of the gun. In these a one-pounder was used for the first two shots and a three-pounder for the last. For the one-pounder a charge of 60 grams of smokeless powder was used, giving a muzzle velocity to the shell of 2,000 ft. per second. The thickness of metal at the point of impact was $1\frac{1}{2}$ in. and the shot



Penetration of 1-lb. Shot in Cast Steel Cylinder.

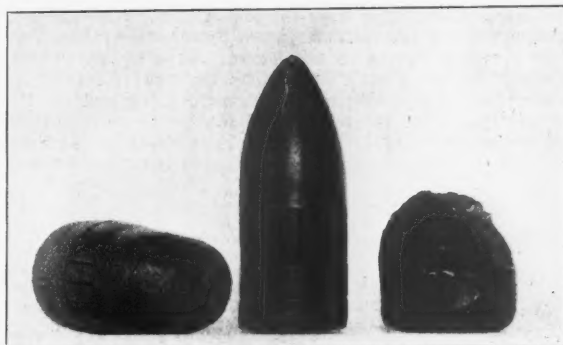
developed no flaking or cracks upon the outside, while the fringe rolled up was even and about $\frac{1}{2}$ in. high, as shown by the engraving. On the inside there was a fringe of metal carried away with a flaking that ran out so as to cover an area of $2\frac{7}{32}$ in. by $2\frac{7}{32}$ in. In this there was a complete penetration. The second shot was a repetition of the first in every particular, but the shot did not go

through, as it was fired against a point where the metal was thicker. In this case the point of the shell penetrated and the remainder broke off and rebounded. There was no fringe, as in the case of the first impact, and only a slight flaking around the outside of the hole.

The third shot was fired from a three-pound gun with a charge of 300 grams of sundried Indian Head Proving Ground powder, giving a muzzle velocity of 2,200 ft. per second. There was a fringe about the point of impact as in the first case and no cracks or flaking was developed. In this the shell penetrated about 3 in. and remained in the hole, the base being broken off. The illustration of the cylinder shows the points of impact of the three shots. The first (No. 1) was against and penetrated the barrel; the second (No. 2) was between the brackets at the side of the steam chest, in which the remains of the shell can be seen, and the third (No. 3) is above and about on a line with the center of the steam chest.

The condition of the shells after the firing is shown in a separate illustration by which the amount of injury received is apparent. The views are numbered to correspond to the shot numbers from which it will be seen that the first shell, which penetrated the barrel, suffered a slight injury at the point, while the other two were broken, the three-pound shell being the worse of the two.

The regular physical tests of the metal gave a tensile strength of 76,000 lbs. per sq. in. of section, with a limit of elasticity of 36,000 lbs.; an elongation of 28.5 per cent. in 2 in. and a reduction of area of cross section of 34.6 per cent. This shows that the tensile strength of the metal is somewhat higher than the ordinary specifications require for boiler plate, though there is a somewhat wider margin between the ultimate strength and the limit of elasticity than plate would usually show. The elongation is high, however, from which the ductility and softness may be inferred, and which undoubtedly accounts for the absence of flaking and cracking about the holes made by the shells. While these tests can hardly be taken to represent the stresses to which locomotive cylin-



No. 2. No. 1. No. 3.
Shells After Ballistic Test of Cast Steel Cylinder.

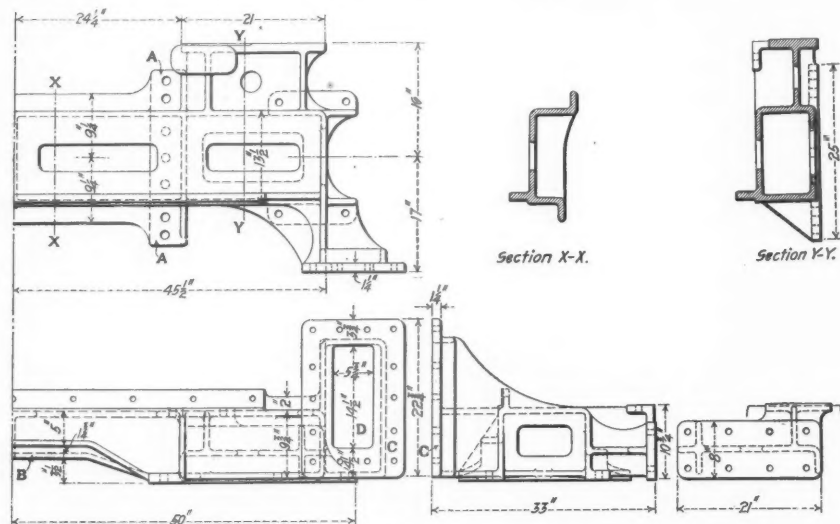
ders will be subjected in service, they are interesting as a contribution to the general fund of information regarding the toughness of the metal that is available for use in so large and complicated a casting.

State Rights With Interstate Trains.

The recent decision of the Supreme Court of the United States in the Mississippi case, though in favor of the railroad, sustains in a general way the powers of the state commission. The Mississippi commission had issued an order requiring the Illinois Central to stop certain through trains between Chicago and New Orleans at Magnolia, a town of 1,200 inhabitants. The United States Circuit Court sustained the commission, but the Circuit Court of Appeals reversed this action and decided for the railroad. The Supreme Court has sustained the Circuit Court of Appeals in an opinion by Justice Peckham, in which it is held that a railroad commission has a right, under a state statute, to compel a railroad company to stop its trains where the company does not furnish proper and adequate accommodation to a particular locality, and that the order may embrace through interstate trains. But, if the company has furnished all such proper and reasonable accommodation to the locality as fairly may be demanded, then any interference with the company by causing its interstate trains to stop at a particular locality in the state "is an improper and illegal interference with the rights of the railroad company and a violation of the commerce clause of the Constitution." It was found that the company had fully performed its duties toward Magnolia and that the order was improper and illegal. In concluding Justice Peckham said:

"The transportation of passengers on interstate trains as rapidly

as can with safety be done is the inexorable demand of the public who use such trains. Competition between great trunk lines is fierce and at times bitter. Each line must do its best even to obtain its fair share of the transportation between states, both of passengers and freight. A wholly unnecessary, even though a small, obstacle might not, in fairness, be placed in the way of an interstate road, which may thus be unable to meet the competition of



Details of Frame Crosstie; Cole Four-Cylinder Compound Locomotive

its rivals. We by no means intend to impair the strength of the previous decisions of this court on the subject, nor to assume that the interstate transportation, either of passengers or freight, is to be regarded as overshadowing the rights of the residents of the state through which the railroad passes to adequate railroad facilities. Both claims are to be considered, and after the wants of the residents within a state or locality through which the road passes have been adequately supplied, regard being had to all the facts bearing upon the subject, they ought not to be permitted to demand more at the cost of the ability of the road to successfully compete with its rivals in the transportation of interstate passengers and freight."

Interstate Transportation of Intoxicating Liquors.

In the case of Paul Heymann, plaintiff in error, vs. Southern Railway, the Supreme Court of the United States on December 3 rendered a decision that makes more clear the interpretation of the so-called Wilson act which provides that intoxicating liquors transported into any state or territory shall, "upon arrival in such state or territory," be subject to the police laws of that state or territory. Two residents of Charleston, S. C., had each ordered a cask of whiskey from Heymann in Augusta, Ga., sending the price with the orders on the understanding that if delivery was not made the money would be refunded. The whiskey was delivered to the railroad at Augusta. On arrival at Charleston the casks were unloaded into its warehouse, ready for delivery, but before the consignees had been notified, the goods were seized, without warrant or other process, by constables asserting their right to do so under the dispensary law of South Carolina, the agent of the railroad company not resisting the seizure. Heymann sued the road in a Georgia court for failure to make delivery. The case turned on the question of whether the seizure had been lawfully made—whether the goods had yet passed from the protection of the interstate commerce clause of the Constitution of the United States and had become subject to the state law. The railroad contended that the seizure was lawful. The Supreme Court of Georgia decided in favor of the road, holding that certain expressions of the Supreme Court of the United States in earlier cases as to delivery being essential to complete "arrival" under the Wilson act were obiter and not binding. The Supreme Court of the United States reverses this decision, holding that the Wilson act does not give a state jurisdiction until after delivery. It follows that the railroad permitted the whiskey to be taken from its possession illegally, and Heymann wins. Though not stated in the opinion of Justice White, the inference is conveyed that a technical resistance to the seizure would have relieved the road from liability.

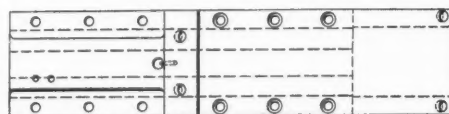
A press despatch of December 7 says that the French Chamber of Deputies has voted, 364 to 187, to purchase the Western Railroad of France. If the bill is passed by the other House the purchase will take effect in about a year.

Guide and Frame Brace for Cole Four-Cylinder Compound Locomotive.

In the description of the Cole four-cylinder compound locomotive published in the *Railroad Gazette* for November 9, reference was made to the guides, and to the combination crosstie for the frame that was set immediately back of the cylinders. Details of these two parts are given herewith. From the cross-section of the guide it will be seen to be a modification of the well-known Vogt guide in use on the Pennsylvania Railroad having a top wearing surface. There is a broad bearing 8 in. wide in the channel-shaped casting and the guide is held up by two wrought-iron, case-hardened straps $\frac{3}{4}$ in. thick. The guides for the high and low-pressure cylinders are the same except for the minor details of the fastenings.

The crosstie is made to fill a variety of purposes. It is a steel casting, and, besides acting primarily as a frame crosstie, it serves as a guide yoke and a base to which to bolt the rocker boxes. The engraving shows half of the casting which is of steel. It is bolted to the frames at the lugs A A by $1\frac{1}{4}$ -in. bolts, and is raised at the center at B to clear the high-pressure connecting rods.

To the overhang outside the frames are bolted the link brackets for the Walschaert valve gear, the low-pressure guides and the rocker boxes. The link bracket is bolted to the rear face of the casting at C, through which there is an opening D for the passage of the radius bar. The guides are bolted to the lugs at E and the rocker box to the front face at F. While there is nothing particularly remarkable about this casting, and it will probably be greatly lightened in future engines, it shows how well this detail can be worked out to give great strength to the frame and



Details of Crosshead Guide.

tie all of the working parts together so as to make them practically one piece, when the space between the frames is left clear, as it is with the Walschaert gear.

American Railroads—A German View.

III.

Parts of the report of two prominent members of the Prussian Railroad Council who spent several months in 1904 in studying American railroads were published in the *Railroad Gazette* of September 7 and September 28. The first article covered the second chapter of the book published as a result of their studies and the second article part of the twelfth chapter. These two chapters are particularly interesting to American railroad men because they contain remarks of a general character. The following is a continuation of the twelfth chapter of the report:

With a length of 208,352 miles of line at the end of June, 1903, the track length of railroads of the United States amounted to 285,418 miles, or only 1.37 times the length of the mileage worked. The Prussian-Hessian railroads with 19,979 miles of line had a track length of 39,078 miles, or 1.96 times the road length, against a proportion of 1.92 of trackage to mileage on the railroads of the thickest traffic group of the eastern part of the United States with their decidedly higher receipts per mile. More than this the rolling stock of many American railroads is absolutely inadequate, so that the relatively large purchases made in recent years will have to be continued for some time to make up for the necessary amount of equipment.

If it must be acknowledged that the Americans have done admirable work in creating an enormous network of railroads within a period of hardly 60 years, to accomplish which great difficulties had to be overcome, it must also be remembered that extensive land

grants were made free to the railroads and that other assistance was given. These land grants enabled the companies not only to build their roads cheaply, but once in operation, to transform previously worthless land into valuable property by supplying transportation facilities. Through the sale of these lands, their income has often been greatly increased.

In spite of all the mistakes made, particularly in the financial development, the amount of money invested in American railroads on which interest must be paid is even to-day after all improvements which have been made in recent years, considerably lower than the amount invested in German railroads. Nevertheless, examination and comparison of the two countries does not show results unfavorable to the German roads. This is the more remarkable because American railroad experts are of the opinion that many of their methods, in particular the use of large capacity cars in passenger and freight traffic, the frequent renewal of locomotives by new ones of large and better construction and other similar methods differing more or less from German practice, tend to considerably reduce expenses and consequently to increase net earnings. To what extent, by adopting at least in part in our practice American ideas, we would succeed in reducing expenses is hard to say. American railroads have an advantage in this respect in that they pay a comparatively low price for new cars, because uniformity in construction of equipment enables the factories to work economically and therefore sell cheaply. In other words, rolling stock is an article which in America is manufactured en masse. In some branches of American railroading more economical ideas might be introduced. Not all of the expenses of American roads are lower than ours. According to our observations the costs of the traffic service department service and the direct expense of management are particularly expensive, more so than in Germany, in spite of all supposed drawbacks of State's management.

To prove our statement that American railroads do not work with a lower expense account than ours, passenger fares and freight costs must be considered together instead of separately, that is, the receipts coming to the railroad from both passenger, freight and all other sources of income must be grouped in totals. This is particularly necessary in considering American railroads because certain large receipts are artificially separated from the totals, preventing a true comparison between the two countries. While in America one is accustomed to see big combinations for the purpose of concentrated management, the development of some branches of traffic shows the opposite phenomenon. We refer to the operation of those branches of the service which by nearly all American railroads are turned over to the Pullman company and to the express companies. Such a relation even from the standpoint of the management is not free from objection, because the railroad official to a certain extent ceases to be master in his own house and because there can be no doubt that by the double and multiple organization thus created, costs of management for the whole traffic service are essentially increased. We tried in vain to find out why this system was followed. Historical development alone with such a practical people as the Americans would not have prevented the railroad companies from consolidating the different branches of the service if it had proved the more advantageous course; therefore, one is not likely to mistake in supposing that other reasons favor a continuance of the present system. The American railroads apparently do not wish to stop this division of business with other companies. They allow these companies to collect at very high prices direct from the public, and by contracts with them secure substantial advantages for themselves. Thus they not only relieve themselves from carrying certain branches of traffic like first-class passengers and small parcel traffic which require a specially large proportion of operating expenses, but in both branches of traffic they secure for themselves special sources of income which are not possible under the German system of direct management of these services. But who pays the very high bill? The public! And it really makes no difference to the public whether the railroads or the other companies collect the bill. The railroads seem to believe that it gives them a certain moral advantage if they do not come out in the open in this business. The same thing is true in a somewhat different way with the mail service. The rates paid by the Government are much higher than ours, the people must pay them directly in postal charges and if this is not sufficient to cover the expense, indirectly in taxes.

No matter whether railroads be owned by the State or by private companies it is invariably their duty as public institutions to carry on traffic in the safest way possible and to do justice to the traffic requirements of the country which they serve without discrimination. Their traffic should be carried at rates which do not interfere with the public good and which at the same time secure a due profit on the money invested. American railroads have not yet generally succeeded in fulfilling these requirements. Therein will be found the main reason why the American roads have not yet become a homogeneous part of the political and economic life of the country, but are looked upon by a large part of the people as more or less of a thorn in the flesh.

Yet American railroad companies in general do not lack the desire to live up to their duties. It must be remembered that the expenses of the roads are strongly on the increase. If we take into account that for many years large amounts must be spent in improvements in order to serve the public well there seems little chance that the roads will be able to reduce rates. On the contrary, we believe that American railroad companies will have to look in the future to higher rates to maintain their profit. This is already manifest in the rise in freight tariffs. In passenger fares an increase will hardly be possible because they are already very high, especially to the large lower mass of people who travel in Germany at the lower class rates. The average passenger pays much higher rates than in Germany and other traveling expenses are relatively higher.

The endeavor of the State railroads of Germany has for many years been to reduce cost of carrying the freight traffic. Of course, in America, looking at the question from a purely economic standpoint, a gradual increase of freight rates has no such detrimental effect as it has with us. Even if goods become slightly more expensive on account of the increase in rates, America can count on selling its goods at home. Not so Germany. Germany has an enormous population of working people whose large increase in numbers carries with it only a small increase in absorbing power of the products of the country. Germany, therefore, has to depend on export business to support its otherwise superfluous population and keep it from emigrating. An increase in German freight rates would reduce exports. For more than 25 years the freight tariffs of the Prussian State railroads have been moving downward and it is probable that further reductions are to be expected. The American producer, however, will have to submit to a gradual increase in freight rates for the reason that the railroads cannot afford not to keep up with the requirements of their traffic. If they failed to do so industry would severely suffer. The losses which are likely to come to the American people by further increase of freight rates would be lessened if it were only possible to lead the rate policy of American railroads into more even ways. The lack of steadiness, clearness and justice in railroad tariffs still plays an important part in American practice. Certainly the extensive combinations into great systems have brought about a good result in doing away with sudden changes in freight rates, but on the other hand other disadvantages have become much more apparent for which no cure has yet been found. Yet from an unprejudiced standpoint one would do wrong to the American roads in general by denying that as a whole they have made great progress in financial and economic management.

The Paris Subway.

It would be hard to find a more striking example of triumph due to stubborn perseverance over apparently insuperable difficulties than is afforded by the story of the Paris Metropolitan Railway. The five years, from 1896 to 1901, were consumed in wearisome discussion, mostly provoked by subtleties of party politics between representatives of the state and the city of Paris as to which of these two authorities should control the lines, and whether the lines should be purely local and Parisian or in junction with the great trunk railroads that have their termini in Paris and are partially under state control. Finally, the city of Paris won the day, and, while reserving for itself, except for two lines, for which a supplementary concession has since been granted, all the sub-structural work such as tunnelling, erection of viaducts, bridges and so forth, it conceded to a joint stock company, largely financed in Belgium, the Paris Metropolitan Railway Company, a thirty-five years' lease for the commercial exploitation of the line and the construction and furnishing of the rolling stock and stations and all the electrical apparatus and building works above ground. A notable spirit of democracy appeared in the terms of the lease and excited much controversy at the time they were promulgated. The company was obliged to grant its employees ten days' holiday each year and a whole holiday each week. If a workman fell ill full wages had to be paid to him for at least a year, and in the event of his being the victim of an accident occurring at the works he was to receive full wages until he had entirely recovered. Workmen who were undergoing their annual military training with the colors were also to be retained on the full payroll. All accidents had to be insured against at the sole cost of the company. Workmen on completion of two years' service were to receive a bonus, and pensions were also fixed on a liberal scale.

The total length of the 8 lines is 77 kilometers, or 46½ miles. The cost was \$1,650,000 a mile. When all the lines have been constructed a total of 5,000,000 cubic meters of earth will have been excavated, 2,200,000 cubic meters of masonry will have been built up and 67,000 tons of metal will have been utilized. The average total number of workmen employed week in and week out has been 3,300.

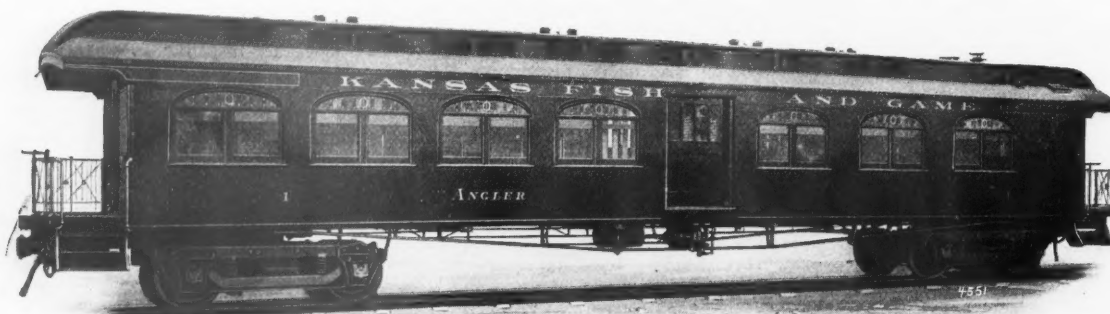
The engineers had a much easier task than the engineers of

either the New York or the London subterranean railway, and they were able to decide in favor of constructing the line at a relatively small distance from the surface. Paris is built on a plain and the general character of the geological strata is sandy or chalky. Where sand is found it is generally fine and nearly always impregnated with water. Owing to the crumbly nature of the ground, due to an extraordinary number of abandoned quarries, dating from almost historic times, nearly all the excavation has been done by hand.

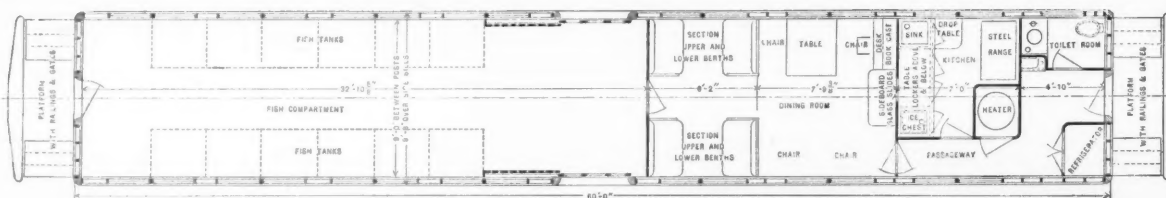
The problem of ventilation is not yet solved. The cutting

the Baker heater also opens on this passageway. The trucks are the builders' standard four-wheel design with Schoen 30 in. pressed steel wheels.

The car is to be used by Mr. R. M. Travis, Fish and Game Warden of the State of Kansas, for distributing young game fish for stocking the Kansas streams and small lakes; also as an exhibit car for demonstrating the work of the Commission. Similar cars are used by the United States Fish Commission, and by the State of Missouri, but being the latest, the Kansas car is said to be more



Car for Kansas Fish and Game Commission.



Plan of Car for Kansas Fish and Game Commission.

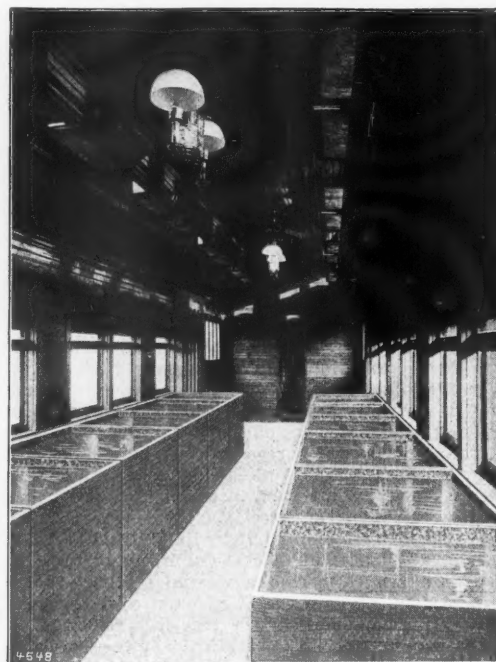
through of outlets to the surface, as has been recently done at points close to the Rome and Belleville stations, and the building of a tall chimney near the Tower St. Jacques, have not been found especially satisfactory, and mechanical ventilation will probably have to be adopted. There has just been erected a gigantic electric fan near the Ternes station, but the difficulty consists in getting a good regular ventilation, such as would not cause drafts violent enough to blow people's hats off.

Under the Seine the line is situated at a great depth beneath the water, there being at one point 66 ft. between the level of the rails and the earth's surface. This section will pass through steel tubes, which are being lowered into the river bed. The two caissons at the wider arm of the river have already been lowered to the required depth, and preparations are being made for sinking the middle section. In the narrow arm the caisson at the left bank is being lowered, and the sinking of the other, which at present is supported on stocks near the Solferino Bridge, will complete the subfluvial portion of the line. Owing to the wet sand near the Place Saint Michel the subsoil is subjected to a drying process which enables the work to be carried out on solid ground. The engineers hope that the whole enterprise will be completed before the end of 1907.—*New York Tribune*.

Car for the Kansas Fish and Game Commission.

A special car built for the Kansas Fish and Game Commission for distribution and exhibition purposes is illustrated by the accompanying engravings. In general appearance it combines features of a sleeping and baggage car, the side doors giving it the latter effect. As the plan shows, it is 60 ft. long and 9 ft. 8 in. wide. The fish compartment occupies a little more than half of the car and the remainder contains the quarters of the Fish and Game Warden and his assistants. The fish compartment is finished in yellow pine sheathing. The fish tanks are galvanized iron incased in yellow pine, and when not in use are covered. For filling the tanks there is a pump driven by a gasoline engine.

The sleeping accommodations of the car consist of four double berths 3 in. wider than the standard. All of the living portion of the car is finished in quarter sawed oak, rubbed finish, and carpeted with Wilton carpet. The dining room has a small extension table and chairs; a writing desk with book-case above, and a sideboard and china cabinet. The sideboard also provides a carving table with two sliding glass doors communicating with the kitchen. The kitchen is complete with steel range, sink, ice chests, dish racks, provision lockers, hot and cold water and other conveniences. There is a refrigerator of large capacity in the kitchen passageway;



Fish Compartment in Car.

conveniently arranged and comfortably and completely furnished. The Hicks Locomotive & Car Works, Chicago, are the builders.

The Russian authorities have been called together to plan measures for avoiding a fuel famine, chiefly due to the disturbances at Baku, and threatening still further to limit the efficiency of Russian railroads and river navigation. The production of crude petroleum in the last year reported fell off nearly one-third, or 7,200,000 tons, equivalent to 10,500,000 tons of coal, and the price has risen nearly 40 per cent., in spite of which the explorations for new supplies have fallen off, only 152 new wells having been bored, against 302 the year before. Refined petroleum exports fell off nearly 50 per cent.

The New President of the Southern.

William Wilson Finley, the new President of the Southern Railway, has had the valuable experience of a training on roads operating under widely differing conditions. He has seen railroad service in the middle South, the Southwest and the Northwest, and has had the past 10 years to apply the knowledge gained in other parts of the country to conditions on the Southern Railway. Mr. Finley was born in Mississippi in 1853, and began railroad work when he was 20 years old as a stenographer on the New Orleans, Jackson & Great Northern, now part of the Illinois Central. During the next 10 years he worked his way up on different southern roads until he was appointed Assistant General Freight Agent of the Texas & Pacific. Mr. Finley retained his position when the road was thrown into a receivership two years later, and was made General Freight Agent in 1886. In 1888 he was appointed General Freight Agent of the Fort Worth & Denver City and other roads comprising the "Panhandle Route," which has since been taken over by the Colorado & Southern. The next year he was made Chairman of the Trans-Missouri Traffic Association, and in 1890 was appointed Chairman of the Western Passenger Association. He spent the next three years as General Traffic Manager of the Great Northern, and then went to the Southern as Third Vice-President. Early in 1896 he returned to the Great Northern as Second Vice-President, but remained there only four months before going back to the Southern as Second Vice-President, where he has been since.

Four-Cylinder Compound Express Locomotive for the Danish State Railways.

There will shortly be completed at the works of the Hannoversche-Maschinenbau-Actien Gesellschaft, Hanover, Germany, a series of four-cylinder compound express locomotives of an entirely new type designed by Mr. Otto Busse, Director-in-Chief of the Mechanical Department of the Danish State Railways, for working the heaviest and most important passenger train services on the main lines of Denmark. Drawings showing the general construction of the engines are reproduced herewith by courtesy of the designer, and in a succeeding issue we shall hope to publish some details relating to the performance of the new locomotives. The cylinders are arranged in line across the bogie, with the high-pressure cylinders between the frames and the low-pressure cylinders outside them. The high-pressure cylinders drive the crank-axle of the leading coupled wheels and the low-pressure the second pair of coupled wheels and only two sets of valve gear are employed for the four cylinders.

The valve gear is of the Walschaerts type, and piston valves $13\frac{1}{4}$ in. in diameter are used for distributing steam, the steam chests being located above each pair of cylinders in the position shown in the cross-sectional view. The cranks on each side of the engine (one high-pressure and one low-pressure) are set 180 deg. apart and at 90 deg. in relation to those on the opposite side of the engine.

The crank axle has single disc crank webs and the body of the axle between them is of the oblique pattern. Boiler steam is admitted, through a reducing valve, to the low-pressure cylinders when it is desired to temporarily increase the power of the engine to overcome train resistance at starting and on heavy grades.

The boiler has two telescopic rings, the second one tapering out at the rear end to the width of the firebox. The latter is of the wide type with sloping back plate and grate and a deep ash-pan. Two firedoors are provided and a special arrangement of regulator handle connection is fitted with the object of bringing it into a convenient operating position for the driver. The handle and its connections are shown in the rear elevation.

The smokebox is of the extended type, and both it and the cab, which latter is of a very commodious pattern, are arranged on the wind-cutter principle.

The main frames of the engine are of the compound type; partly

of bars and partly of solid plate, and the springs of the coupled wheels are equalized with those of the trailing wheels.

The tender runs upon eight wheels, which, however, are not arranged as two four-wheeled bogies with the framing outside the wheels. The axles are set rigidly in the frames with the equalization arranged to work between the front and rear pair of wheels.

These engines mark a decided advance beyond the locomotive standards that have heretofore been in use in Denmark, where machines of a moderate size have been the rule. In this design American, and especially Bavarian, influence is quite marked, and in this connection attention may be called to a few points of resemblance and dissimilarity.

At the front end we find the usual arrangements for coupling, buffing and air connections that regularly obtains in European practice. The smokebox is rather long and the "dry pipe" leading to it has a diameter of only 5 in. The diaphragm and netting are arranged very much in the American manner, except that the exhaust pipe is given a setback which is very unusual in the United States. From the provision that is made for cleaning, it would appear that this arrangement must be very efficient as a spark cleaner, since the hole back of the saddle seems exceedingly small for any purpose other than the removal of fine dust.

In the arrangement of the Walschaert gear it will be noticed that there is a slight modification from the practice usual in this country. In the first place, the gear is set entirely between the frames and is driven by an eccentric on the crank axle, by means of which a straight line drive is obtained through to the valve. The distributing lever is also arranged to take hold of the valve stem below the pivotal point of the radius bar instead of above it, as in current practice in America. For an inside admission for the high-pressure valve and an outside for the low this involves the raising of the link block for the forward motion, which is done.

The crossheads and guides are also of peculiar construction. Of the general Laird type, the cross-head has a bearing at the top and bottom of the two bars of the guide, passing between them by means of stud bolts, as shown in the cross-section.

Following the working parts back, it will be seen that there is a marked difference in the length of the high and low-pressure connecting rods. The length of stroke is the same (24 in.) in each case, but, as the low-pressure drives the rear and the high-pressure

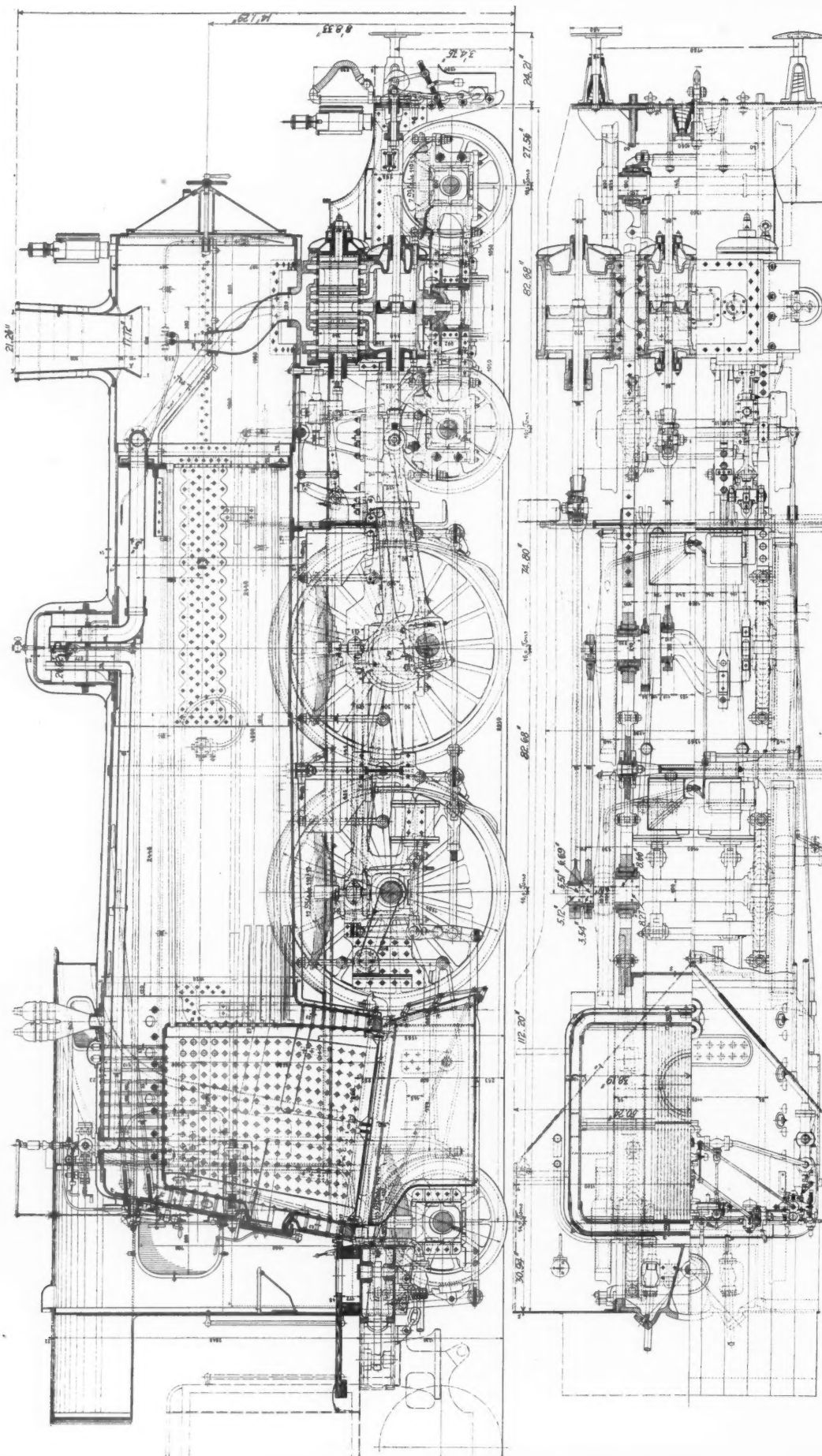
the front pair of drivers, the former has a length of 11 ft. $1\frac{1}{2}$ in. and the latter but 5 ft. $11\frac{1}{2}$ in., thus varying in lengths as proportioned to the stroke of from five to a little less than three to one. It will be remembered that this variation was obviated in the case of the Cole four-cylinder engine described in the *Railroad Gazette* for November 9, by setting the high-pressure cylinders ahead of the low and thus securing an increased length of rod. In this case the opposite course is pursued and a shortening of the low-pressure rod is obtained by lengthening its piston rod and by setting back the guides, though it still remains exceedingly long. The forward truck follows the lines of European practice and has separate semi-elliptic springs at each journal box with no equalization.

The spring suspension is similar to that used upon American locomotives, in that it extends from the front driver to the rear truck, though there is a difference in the construction of the several details. This is particularly noticeable in the case of the spring hangers, which carry their load through a threaded upper end and nut, setting into a slot in the end of the spring instead of the pin or stirrup used on American engines. Of the two the pin and stirrup construction would appear to be the more secure, while it certainly is the cheaper to make.

In the boiler it will be noticed that the throttle valve is of the sliding type that was discarded years ago in America for the balanced poppet valve. This valve also works against a vertical face instead of on top, as in the case of the old valve here. In riveting the horizontal seams are connected by sextuple riveted

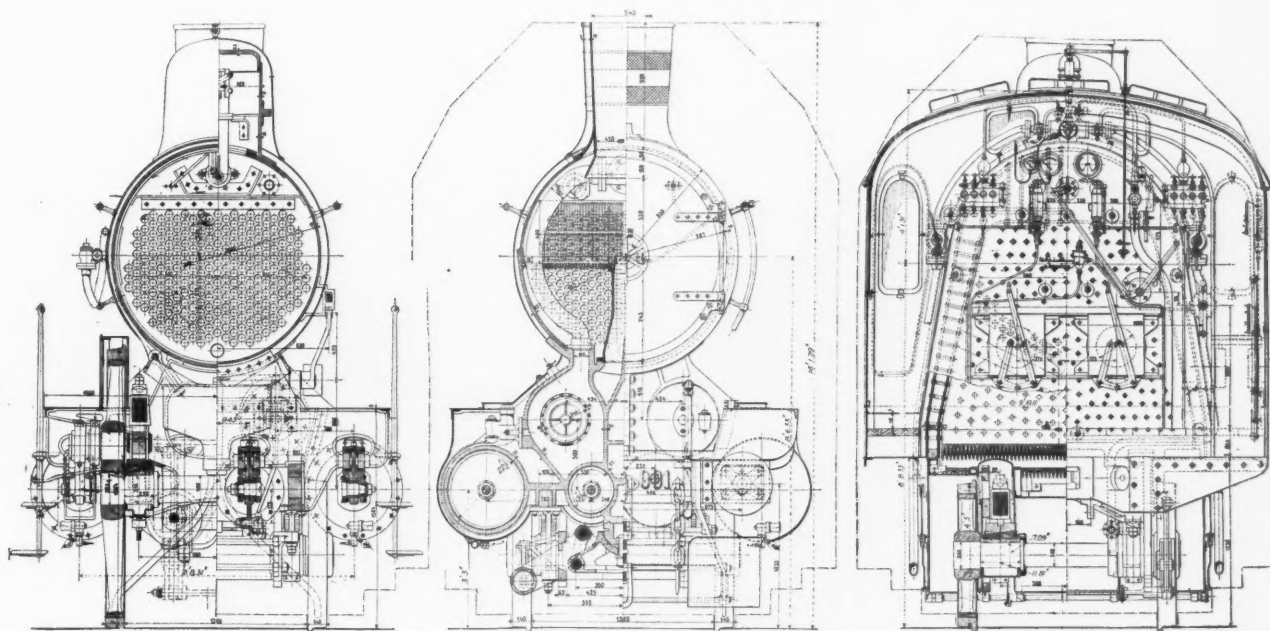


W. W. Finley.



Plan and Longitudinal Section of Four-Cylinder Compound Atlantic Type Locomotive; Danish State Railways.

butt welds, but it will be noticed that the edges of these welds are lbs. In the construction of the cylinders the clearance spaces are cut away or corrugated between the rivets. This is undoubtedly 16.5 per cent. for the high and 9.4 per cent. for the low-pressure. The accompanying diagram shows the tractive power rating of the engine for various speeds on different grades. The maximum



End Elevations and Cross Sections of Four-Cylinder Compound Locomotive; Danish State Railways.

thus holds it with a more uniform firmness against the shell plates, and adds to the efficiency of the calking, but is a refinement that is not found on American locomotives.

The firebox is approximately a cube. Its greatest dimension is the transverse, where it measures 6.36 ft., with a fore and aft one of 5.3 ft., while the height at the front is 5 ft. 2 in. This combination is almost an ideal one for securing efficiency of combustion and would be well to imitate where it is possible.

The material of the firebox is copper, about $\frac{11}{16}$ in. thick at all points except that portion of the tube sheet where the tubes are inserted, at which point it is $\frac{11}{16}$ in. thick. This form of firebox is undoubtedly responsible for the use of the double doors, whose openings are protected from the abrasion of the shovel by a liner at the bottom. The staying is of the radial type. In connection with the tubes, attention is called to the great amount of swaging to which they have been subjected by which their diameters are reduced nearly one-half.

In tests that have been made with the engine it has been found that the boiler has an evaporative capacity of 18,546 lbs. of water per hour, with a smokebox vacuum of 4 in., which corresponds to

tractive effort of the engine is calculated at 18,040 lbs. The formula used for this calculation is

$$T = \frac{1(8.4 d_1^2 + 5.4 d_2^2)}{D}$$

in which

T = the tractive effort.

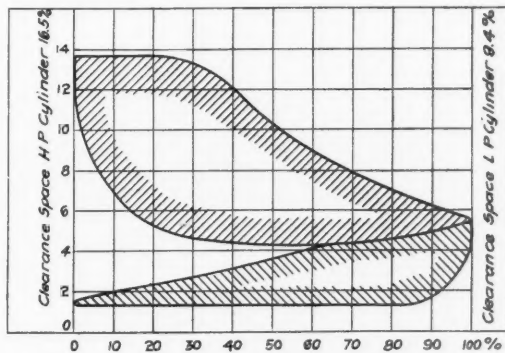
l = length of stroke.

d_1 = diameter of high-pressure cylinder.

d_2 = diameter of low-pressure cylinder.

D = diameter of driving wheels.

The coefficients of the square of the cylinder diameters are the



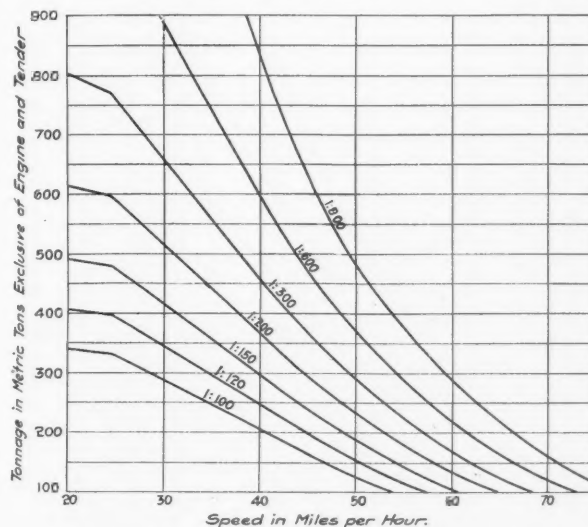
Maximum Steam Diagram at 50 Miles an Hour.

an evaporation of 8.13 lbs. per sq. ft. of heating surface and 534.47 lbs. per sq. ft. of grate area. The highest mean effective pressure in the low-pressure cylinder is 56 per cent. of the boiler pressure, or 119.28 lbs. per sq. in., and that in the low-pressure is 36 per cent. of the same, or 76.68 lbs. per sq. in. At 50 miles an hour, the engine has developed 1,083 indicated metric horse-power on a steam consumption of 17.12 lbs. of water per horse-power hour. Indicator cards are given as taken at this speed, from which it appears that the mean effective pressure of the high-pressure cylinder was 44.11 lbs. per sq. in., and in the low pressure it was 17.75

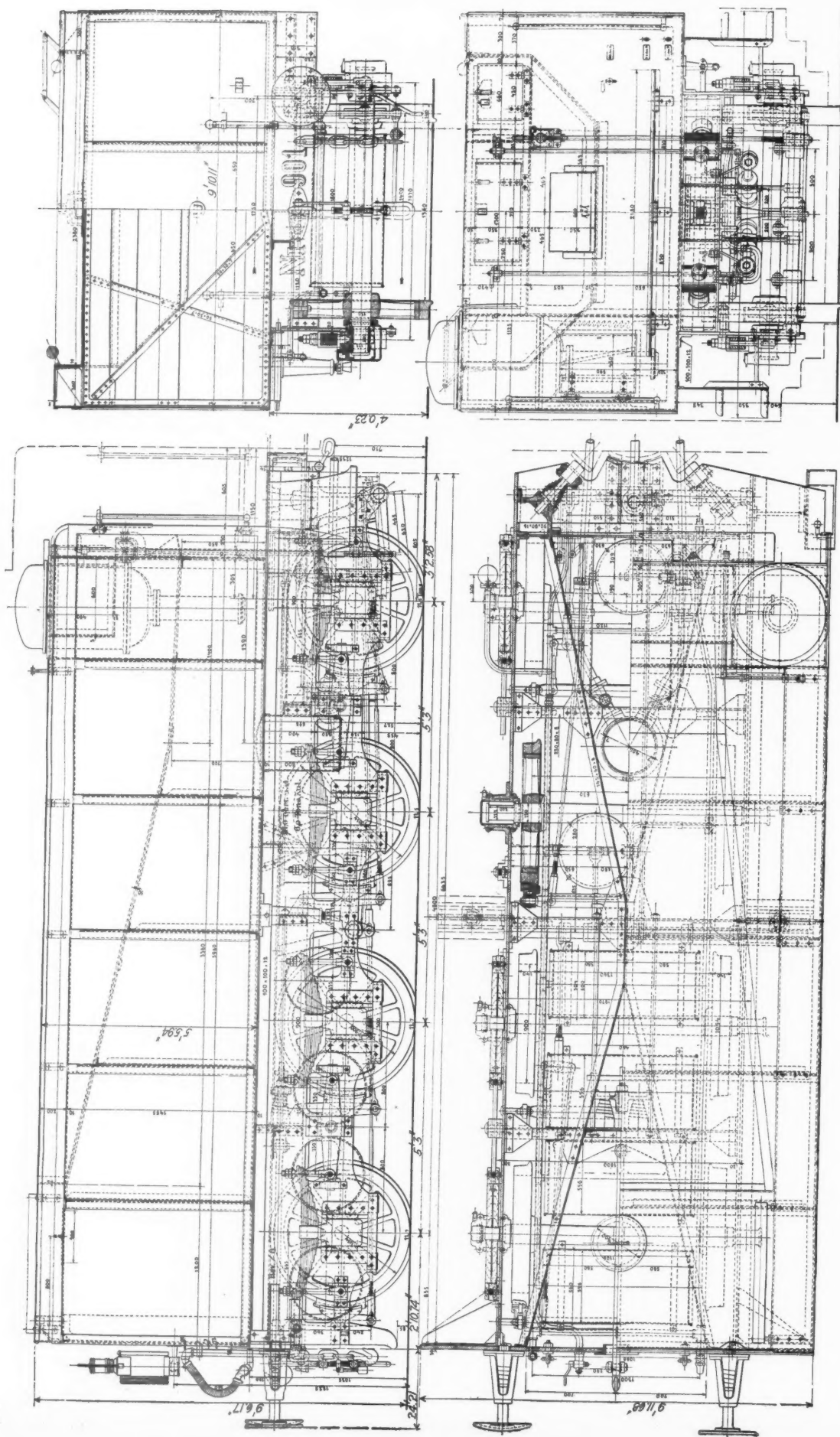
maximum mean effective pressures in kilograms per square centimeter. Converted to English equivalents the formula becomes

$$T = \frac{1(119.28 d_1^2 + 76.68 d_2^2)}{D}$$

This is but slightly different from the formula used on similar engines in the United States, a difference in the coefficients only which does not seem to be altogether dependent upon the ratio of the sectional areas of the cylinders, but upon empirical data obtained with the indicator. On the Danish engine this ratio is as 1



Tractive Power Diagram; Grades as Indicated.



Elevations and Sections of Tender for Four-Cylinder Compound Locomotive; Danish State Railways.

to 2.8, while that of the Cole compound illustrated in the *Railroad Gazette* for November 9 is as 1 to 2.78, or practically the same.

The principal dimensions are as follows:

Cylinders high-pressure, diameter.....	13 1/4 in.
Cylinders low-pressure, diameter.....	22 3/4 "
Piston stroke.....	24 "
Wheels (bogie) diameter.....	3 ft. 6 1/4 in.
" (coupled), diameter.....	6 " 7 1/4 "
" (carrying), diameter.....	3 " 6 1/4 "
Wheelbase, bogie.....	6 " 10 3/4 "
" bogie center to center of h.p. drivers.....	9 " 8 3/4 "
" coupled centers.....	6 " 10 3/4 "
" center l.p. drivers to c. carrying whls.....	9 " 4 3/4 "
" total.....	29 " 8 "
Centers of h. p. cylinders.....	1 ft. 6 3/4 in.
Centers of l. p. cylinders.....	6 " 3 3/8 "
Length of h. p. connecting rods.....	5 " 11 1/2 "
Length of l. p. connecting rods.....	11 " 1 1/2 "
Piston valves, diameter.....	1 3/4 "
Boiler, diam. (inside front ring).....	4 " 11 3/8 "
" diameter (inside at firebox).....	5 " 5 "
" length between tube plate.....	15 " 9 1/4 "
" height of center from rail.....	8 " 8 3/4 "
" number of tubes.....	265
" diameter (outs).....	2 1/2 in.
Heating surface, tubes.....	2,054.4 sq. ft.
" firebox.....	128.4 "
" total.....	2,182.8 "
Grate area.....	34.7 "
Tubes, length.....	15 ft. 9 in.
Steam pressure.....	213 lbs.
Weight of engine in working order: On bogie.....	20.4 tons.
On coupled wheels.....	32.0 "
On trailing wheels.....	14.7 "
Total, engine.....	67.1 "
Tubes, number.....	263
" length.....	15 ft. 9 in.
" diameter.....	2 "
Weight on drivers.....	70,400 lbs.
" on front truck.....	44,880 "
" on carrying truck.....	32,340 "
" total.....	147,620 "
" of tender in working order.....	99,000 "
Tank capacity, water.....	5,550 gals.
Tank capacity, coal.....	6 tons
Tractive power.....	18,040 lbs.

Brake..... Hydraulic

Weight on drivers = 3.90

Tractive power

Total weight

Tractive power = 8.24

Tractive power x diameter drivers = 655.0

Heating surface

Equivalent firebox heating surface (Vaughan formula) 678.4

Heating surface = 59.20

Grate area

Firebox heating surface = 0.059

Total heating surface

Weight on drivers = 32.25

Heating surface

Total weight

Heating surface = 67.63

Volume 2 H. P. cylinders, cu. ft. = 3.98

Heating surface

Volume 2 H. P. cylinders = 548.44

Grate area

Volume 2 H. P. cylinders = 8.72

Receiver vol.

Volume of H. P. cylinders = 1.26

Third Rail Versus Overhead Construction.

At a time when nearly every railroad manager confronted by dense passenger traffic at large centers has electrification on his mind, it seems worth while to print the following comparison of the overhead and third rail systems, viewed solely from the standpoint of their respective dangers and disadvantages. It is quite possible that there may be differences of opinion about some of the points listed. If so, we shall welcome contributions on the subject.

MEMORANDUM OF COMPARATIVE DISADVANTAGES OF THIRD RAIL AND OVERHEAD WORKING CONDUCTORS.

THIRD RAIL.

(a) Hindrance to ordinary maintenance of track.

(b) Danger from derailments.

OVERHEAD CONSTRUCTION.

(a) Inelasticity of construction, which prevents the laying of additional tracks or changes of grade and alignment without requiring radical expensive alterations in the permanent overhead structures. This is one of the reasons why the Baltimore & Ohio R. R. abandoned overhead construction a number of years ago and substituted therefor third rail.

(b) Danger from derailments knocking down a supporting structure, which would affect not only the track upon which the derailment occurs, but also all other tracks on

THIRD RAIL.

c) Increased difficulties of wrecking due to inability to throw the wrecked equipment to one side.

(d) Interference with piling snow between tracks due to presence of third rail construction.

(e) Other objections have been made as, for instance, troubles with snow and sleet, complications at frogs and switches, difficulties of current collection and great danger to employees and trespassers. Extended experiments have proven the fallacy of these objections, provided the rail is properly designed and protected. Objection has also been made to the use of the third rail because of the interference with the clearance lines of equipment, but inasmuch as several trunk line railroads have already adopted third rail so as to fix the standard outlines of equipment, other railroads must naturally adjust the outlines of their equipment to the clearance diagram that has already been adopted to fit third rail conditions, in order that traffic may be interchanged.

OVERHEAD CONSTRUCTION.

perhaps a four-track railroad, with possibly an accident to more than one train.

(c) Increased difficulties of wrecking due to crane boom interfering with overhead conductors.

(d) Danger to trainmen on tops of cars.

(e) Danger to the public at overhead street and highway bridges, especially with 11,000-volt current.

(f) Danger to trains in tunnels, at low bridges and at other places with restricted clearances, owing to the possibility of rearing cars in cases of derailment, making contact with the highly charged 11,000-volt working conductor.

(g) Danger to trains where the overhead conductor, carrying, for instance, 11,000 volts, is within two or three feet of moving cars. In the City of New York, for instance, the public authorities have even taken a decided stand against wires carrying high voltage on transmission lines remote from the track.

(h) Corrosion due to freight locomotive gases. This is a very serious item, as the corrosive action of sulphurous gases not only causes a rapid deterioration of steel overhead structures, but also requires expensive annual scraping and painting. This item also carries with it the danger to painters and others engaged in cleaning, painting and repairing structures over tracks in constant operation and in close proximity to 11,000-volt conductors.

(i) Interception of the view of signals by motormen and enginemen where dips in the grade of the railroad cause the overhead bridges to interfere with the view of the semaphores in advance of the foot of the grade.

(j) Interference with the enginemen's and motormen's view of signals due to the truss members of the overhead transmission bridges acting as a bad background for semaphores.

(k) Danger to signalmen in maintaining the signal structures on the lower side of the overhead transmission bridges carrying 11,000-volt conductors.

(l) Legal obstacles to overhead construction, as, for instance, on the Park Avenue viaduct, and refusal of city authorities to grant permits.

(m) Soot from freight steam locomotives depositing on overhead insulators, entailing heavy expense and interruption of traffic during the time required for cleaning insulators to prevent short-circuits.

Report of President Harriman on the San Francisco Disaster.

The following report, published as an appendix to the annual report of the Union Pacific recently issued, was made to the Board of Directors of the Southern Pacific Company by President Harriman on October 4, 1906, covering the San Francisco earthquake and fire:

TO THE BOARD OF DIRECTORS SOUTHERN PACIFIC COMPANY:

An earthquake occurred at San Francisco, on Wednesday, April 18, 1906, at 5:15 a. m. (8:15 a. m., New York time). This was immediately followed by a number of fires in the business and lower sections of the city, which rapidly spread into a general conflagration that could not be checked on account of the breaking of the water mains, which cut off the water supply. The fire raged for three days, and was not brought under control until the night of April 20, when the people succeeded in stopping the progress of the fire towards the Western Addition, at Van Ness avenue and Franklin street. The homes of at least 200,000 people were burned, and the ordinary sources of food supply for the city cut off, so that it became necessary to furnish food for practically the entire population of San Francisco, to improvise temporary shelter for those whose homes were burned, and to carry away large numbers of people fleeing from the city.

Reports of the disaster were received in New York about 9 a. m.

(New York time), and immediately telegrams were sent to the officers in charge of the Southern Pacific and Union Pacific Systems directing them to act quickly and to co-operate with the officers in charge at San Francisco in doing all that could be done to relieve the distress and, before the day was ended, all the forces of both systems were actively co-operating in the relief work. In order that I might give personal assistance and encouragement, I left New York on the morning of Thursday, April 19, and arrived at San Francisco on Sunday, the 22d.

Relief supplies, consisting of food, medicines, medical appliances, and other articles needed in the emergency, were immediately collected in the larger towns and cities on the System and moved rapidly towards San Francisco, so that their delivery to the several distributing places in San Francisco was begun on the evening of April 18 and thereafter continued, so that it may be said that no one needed to be in want of food, and that everyone was able to secure some shelter after the first night. To expedite the delivery of supplies, the number of cars, not only those originating on our own lines, but also cars tendered by connections, was limited to 10 or 15 per train, so as to make passenger train time. This service was continued until advised from San Francisco that a sufficient quantity had been received to provide for immediate wants; thereafter they were carried on regular fast freight trains. In the 35 days following the disaster over 1,600 carloads of relief supplies and over 224,000 passengers were carried free. The company not only gave freely this important service, but the interruption to its regular passenger and freight business was naturally very great, and this, of course, added largely to the expense of taking care of the situation.

The Trans-Bay steamers maintained their regular 20-minute schedules between San Francisco and Oakland, with the exception of a few hours when it was reduced to hourly service because of the impossibility of obtaining fresh water for the boiler supply of the boats. After this short interruption, the usual 20-minute service was resumed and regularly maintained thereafter. The local train service connecting with the boats was also regularly maintained, and although very large crowds were handled, which taxed facilities to the utmost, no accident or injury occurred. In view of the fact that this extraordinary disaster was encountered without warning and under circumstances of great excitement, it is almost miraculous that such a large traffic could be handled under these trying conditions without serious injury to any person. Such a result is certainly the highest proof that could be had of the ability and efficiency of the men in charge of this work. On April 19, the day of heaviest travel, 1,073 carloads of refugees were transported. On the 20th, nearly as large a number were carried, and the movement continued extremely heavy until April 26, when, on the suggestion of the Mayor, the General of the Army, and the Citizens' Committee, unrestricted free transportation was discontinued. In addition to the free service performed by the regular ferry steamers, the company sent its river steamers and extra ferry steamers to take passengers from outlying wharves and landings to the eastern side of the Bay.

Information bureaus were established on the 20th and the 21st at nine points in the city, served by horseback riders, who posted notices advertising free service and particulars as to movements of trains and relief work, inquiries about missing people, statements of accommodations, relief provided by outside cities, etc. In the destruction of power houses and street car tracks, automobiles furnished about the only means of communication. Gasoline for these vehicles was furnished from the company's stores as long as the supply lasted, and the assistance thus rendered to relief committees, physicians, military and civil authorities was highly appreciated. Explosives were issued free from the company's stores on request of the San Francisco Fire Department. Three of the company's steamers were placed at the disposal of the Quartermaster's Department to handle relief supplies and they remained in service without charge until May 26. All of the company's shed facilities in San Francisco were tendered for the immediate relief of the homeless. A number of teams engaged in the construction of the Bay Shore line were turned over to the Government to be used in hauling supplies; the wages of the teamsters were paid by the company. Temporary tracks were laid on request of the city authorities on a great many of the paved streets, for the purpose of removing debris and hauling in material for rebuilding.

Fortunately the fire was checked on the side of the street opposite the company's freight terminals. Its general hospital, a modern and thoroughly equipped building, was burned; its 150

patients, many suffering from severe injuries, were all safely removed under the immediate charge of the Chief Surgeon and his staff and were accommodated in hospitals in nearby cities. In the two days during which the fire was burning towards the hospital, over 250 injured persons were given free attention. The Chief Surgeon and his entire hospital staff, including the nurses, left the hospital only after the removal of the injured, and when there was no longer any possibility of saving it. Some of them remained on duty until they fainted from exhaustion. The Surgeon of the Union Pacific at Portland, and 39 nurses, were taken to San Francisco and gave their time to the care of the sick and injured. The old general office building on Fourth and Townsend streets was destroyed; also the general offices in the Merchants' Exchange Building, with most of the books, vouchers, accounts, records, etc.

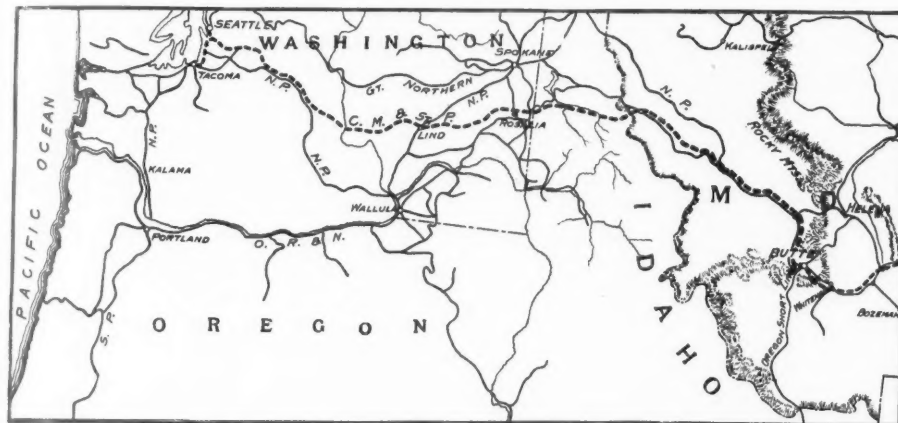
I commend to the Board, the officers and employees of the company in all departments as deserving praise for duty well and faithfully performed, particularly those who remained on duty at a time when their homes and families were exposed to the dangers and terrors of the earthquake and to the subsequent dangers from the flames, whose progress it seemed impossible to arrest. Had it not been for the work of the Southern Pacific Company, the loss of life would have been much greater. The official report shows the loss of 425 lives, although the lives of over 500,000 persons were endangered. The officers and employees of the company deserve the highest commendation for the maintenance of its service, which afforded the means to bring food and necessary supplies to the city and to carry from the city people who found it necessary to go to other places for refuge. The perfect discipline maintained by the working staff of the company reflects most highly on its organization, and the prompt and efficient service rendered contributed largely to the feeling of courage and confidence with which the people of San Francisco faced this calamity.

While the company has done much to relieve this situation, much remains to be done before the city can be rehabilitated. It should be not only the duty but the pleasure of the company to continue in all legitimate ways its assistance in restoring and rebuilding the city. Although the expense of the free service rendered and the loss caused by the interruption in the regular movement of traffic on the lines of the Southern Pacific and Union Pacific Systems were great, I authorized an additional expenditure of \$200,000 for relief work and I now ask your approval of this appropriation.

(Signed) E. H. HARRIMAN.

The St. Paul's Pacific Extension.

A map and brief account of the route to be followed by the first 731 miles of the new line of the Chicago, Milwaukee & St. Paul to the Pacific coast, from Glenham, S. Dak., to Butte, Mont., was given in the *Railroad Gazette* of September 21. This line will cross the Missouri river 12 miles west of Glenham on a bridge of three spans of 425 ft. each, with steel trestle approaches 1,300 ft. long on the



Western Part of St. Paul Coast Extension.

east and 125 ft. on the west side. The track will be about 60 ft. above high water. The piers will be concrete faced with granite and excavation for their foundations will be made by pneumatic process. The superstructure will contain 3,750 tons of metal, for which the contract has been let to the Pennsylvania Steel Company. Its erection, and all pier construction, will be done by the bridge department of the railroad.

From Butte, at the foot of the west slope of the continental divide, the line is to follow the Deer Lodge, Hell Gate, Missoula and St. Regis rivers to a point about four miles west of Saltese, Mont., where the ascent of the Bitter Root mountains begins. St. Paul Pass, the summit, is reached at an elevation of 4,200 feet. A tunnel 8,500 ft. long is necessary in crossing this range. The

line follows the drainage of the St. Joe river to within a few miles of its mouth, and crosses the Idaho-Washington state line just east of Tekoa, Wash. The route between Saltese and the mouth of the St. Joe river is heavily timbered with white pine and cedar.

From Tekoa to the Columbia river a fine agricultural district is traversed, the eastern part of which is well settled. The Columbia river will be crossed by a bridge of 15 spans, with a total length of 2,750 ft., exclusive of steel trestle approaches 1,000 ft. long at each end. The steel in this structure will weigh 40,000 tons. The grade line is 80 ft. above low water. The bridge will have concrete piers.

At Johnson Creek Summit, about 20 miles west of the Columbia river, there will be a tunnel 3,400 ft. long, and at Snoqualmie Pass there will eventually be a tunnel about two miles long at a maximum elevation of 2,569 ft., but for the present operations through the pass will be on a surface line at a maximum elevation of 3,010 ft.

Great forests of fir, red cedar and other valuable timber are tributary to the line between the Columbia river and Puget Sound. At Maple Valley, Wash., connection is made with the Columbia & Puget Sound Railroad, over the tracks of which access is to be obtained to the terminal property purchased at Seattle. A new line will be built from Black River Junction, Wash., to Tacoma, where also a large amount of terminal property has been secured.

The line from Glenham to Butte is under contract to McIntosh Brothers, of Milwaukee. The Bitter Root tunnel and approaches for $2\frac{1}{2}$ miles on each side are being built by Nelson Bennett, of Tacoma. The line between the Bitter Roots and the coast is under contract to H. C. Henry, of Seattle. All steel bridges and trestles will be erected by the bridge department of the railroad.

Grading is completed and track laid from Glenham to a point about 20 miles west of the Missouri river, crossing being made on a temporary pile bridge. Much grading has been done in the Yellowstone and Musselshell valleys, and sub-contracts have been let and forces are at work upon the rest of the line. It is expected that the construction will be completed to Butte by January 1, 1908, and to the coast a year later.

Small Vertical High-Speed Engines.*

To most people, a small engine is something to be avoided if possible. It generally requires constant attention, frequent adjustment, is extravagant in steam consumption, and is difficult to get at to adjust or repair. The main object of most manufacturers seems to be to see how cheap an engine can be built, not how good. This condition has so long prevailed that most people have concluded it is impossible to build a small engine from which the same results can be obtained as from a large one. The troubles to which small engines are incident are commonly accepted as a necessary sequence to their operation.

Efforts have been made to mitigate these evils by various

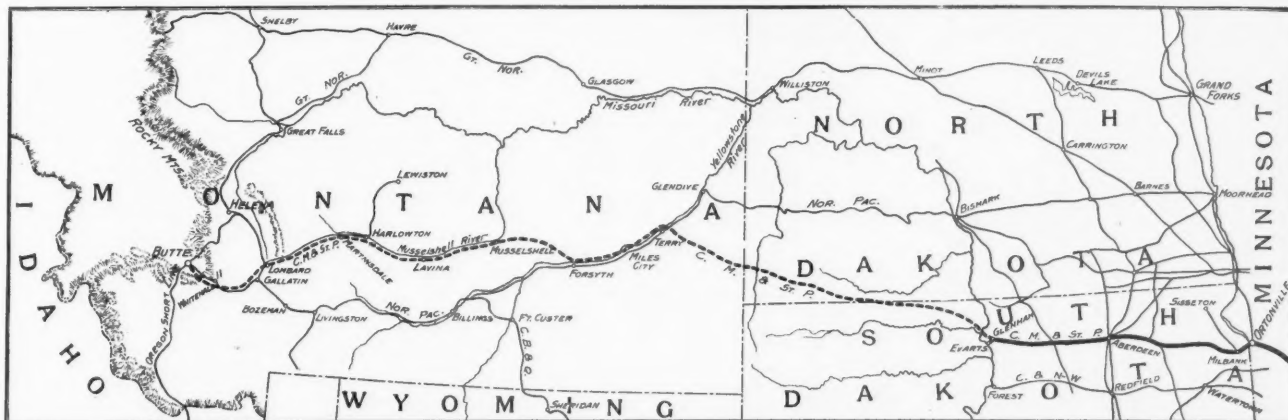
necessity for heavy counterweights would be removed and a smoother running engine would be the result. So he sets out to accomplish this one thing, and very likely thinks out some scheme by which to introduce air compression toward the end of the downward stroke. He becomes so fascinated with this idea that all other details are almost totally neglected. It would be fruitless for any one to attempt to make him see that the same thing can be accomplished in a double-acting engine with a properly designed valve, so as to get the right steam compression at the end of the stroke.

Another designer starts out to build an engine with some "freak" valve, and every other detail is worked around this one central idea, regardless of efficiency. Several have tried to reduce lubrication troubles, principally by splash oiling, with more or less success. If an engine is always in one position and always runs at high speed, this system may give fairly satisfactory results, but it is unreliable on board ships and at slow speeds. Furthermore, it is extravagant in the quantity of oil consumed. These examples will serve to show the usual trend of effort for the improvement of small, vertical engines.

From experience and close observation it was decided that fully 80 per cent. of the small engine troubles are due to improper lubrication; whereas only about 10 per cent. are due to inadequate proportions and finish of the working parts, and the other 10 per cent. to the neglect or ignorance of the operator. It will thus be seen that if such conclusions are correct, the efforts of most of the designers have been in the wrong direction; that greater attention should be paid to proper lubrication and refining some of the details than to the production of something entirely new, with which there are likely to be as unsatisfactory results as before. Anything radically new is more likely to be misadjusted by the average engineer than something built on lines with which he is perfectly familiar.

Being satisfied that these conclusions and deductions were correct, it was decided to carry them into effect, if with no other result than to prove their fallacy. To get away from any fixed notions, and to gain new ideas from the practice of others, and, further, to give "an opportunity to criticise somebody else," an engine designer of long experience in some of the best shops in this country was engaged. Before him were spread these ideas, also what he was expected to accomplish. This briefly was as follows:

(1) An engine that could be sold with a guaranty that it would run three months or more without requiring any attention, either to the oiling system or for adjustments, except the filling of the sight feed cylinder lubricator; (2) an engine that would be economical in the use of steam and oil; (3) that could be easily adjusted and not liable to easily get out of adjustment; (4) that could be used anywhere and for any purpose that an engine can be used for; (5) that had ample bearing and wearing surfaces to make it long lived and unlikely to overheat at full load; (6) that it should be constructed of the best materials for the purpose intended; (7) that it should be devoid of any semblance to "freaks"



Map Showing the Eastern Part of the St. Paul's Pacific Extension.

schemes in design and lubrication, but usually the designer became so wrapped up in the one particular feature which started him into the design, that he lost sight of the other and more important details, never after being within speaking distance of them. For example, one designer may start out to overcome vertical vibration, having a notion that in a multi-cylinder, single-acting engine there is less tendency to this vibration than in a single-cylinder, double-acting engine. An idea comes to him that if he could get compression on the downward stroke so as to slow up the movement of the reciprocating parts before they reach the end of the stroke, the

of every sort, and last, but not least, and, perhaps, the most difficult of all, it must not be so costly to build as to make the selling price prohibitive to the average buyer.

Being thoroughly impressed with the importance of a good system of lubrication, the first step was to work out something more effective than previously used. It does not take much thought to arrive at the conclusion, that if metal does not run on metal, but is always separated by a heavy film of oil, there can be very little wear. The problem then settles down to the production of the necessary heavy film.

In looking over the many systems for lubricating engines, the most rational seemed to be forced lubrication by means of a pump. But experience shows this has many defects. The oil be-

*Condensed from a paper read before the Detroit Engineering Society by F. R. Still, Member of the Society, and printed in the Journal of the Association of Engineering Societies.

ing under pressure necessitates extreme care in adjustment, as any bearing being looser than another vents the entire system and destroys the desired effect. Again, any foreign material that may get into the small tubes or grooves which are an essential part of this system will be rammed in tight by the oil pressure. To overcome these objections it was decided to adopt a gravity flow, the oil being lifted by a pump to the top of the frame, from which elevation it would flow downward by gravity. In this way large tubes can be used; the velocity of the oil will be rapid, the volume of oil in circulation will be much greater, it will not be necessary to have the bearings tight, neither will they all have to be adjusted exactly alike, and any foreign matter will be washed out, instead of being rammed in.

Being satisfied that this came close to the ideal way of producing the flow of oil, the next step was to distribute the oil along the bearing and wearing surfaces to completely separate them by that all-essential film. For ages it has been common to groove the upper or lower half of the journal box or perhaps both. There are as many ideas on the proper way to groove a box as there are people in the business, and there are evidently many more who have no ideas at all, judging from the way it is sometimes done.

Considering the question from a mechanical standpoint, it is at once apparent that an oil film takes up space, so a bearing cannot be tight or the oil cannot get in unless it is forced in at a pressure greater than is exerted on the journal. The thicker the film, the more space there must be between the metals, hence a loose bearing is desirable if it does not cause pounding. When the crank is on the downward stroke, it pushes the journal away from the upper part of the bearing. The shaft is also rolling in the direction the crank is traveling. Hence, the oil should enter at the beginning of the gap which intervenes between the shaft and bearing and thence be rolled up into the remaining space by the rotation of the shaft. The gap naturally begins at one side of the circumference of the shaft, so the oil grooves should most naturally be on the sides. After the crank passes the lower center on the up-stroke, oil should flow in from the groove on the opposite side in the same way. These grooves can thus be made large, say, from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. in width, and the whole length of the bearing metal. The same scheme is applicable to the oiling of the main bearings, crank-pin, crosshead pin, eccentric and governor weight pin, and it works to perfection, better even than was ever thought possible.

There were many other problems in the perfection of this system which had to be worked out, that were, perhaps, equally as interesting in connection with this oiling system. For instance, after the oil has performed its usual functions it must be filtered, cooled and the water separated from it. Any of the usual methods of filtration were found unreliable, as they all allow pieces of lint or grit to pass through. After much experiment it was found that a plain closely-woven cloth suspended by four hooks from each corner of the frame, hanging just below the crank and above the oil in the base, gave the best results. All the oil dripping down from above lodges on this cloth and passes through to the reservoir below. Any foreign matter is left on top and has no tendency to leave the upper surface. Simple as it is, it has been surprisingly effective. As an extra safeguard a fine copper wire screen of ample area was attached to the pump suction and another to the discharge, both being easily removable for cleaning.

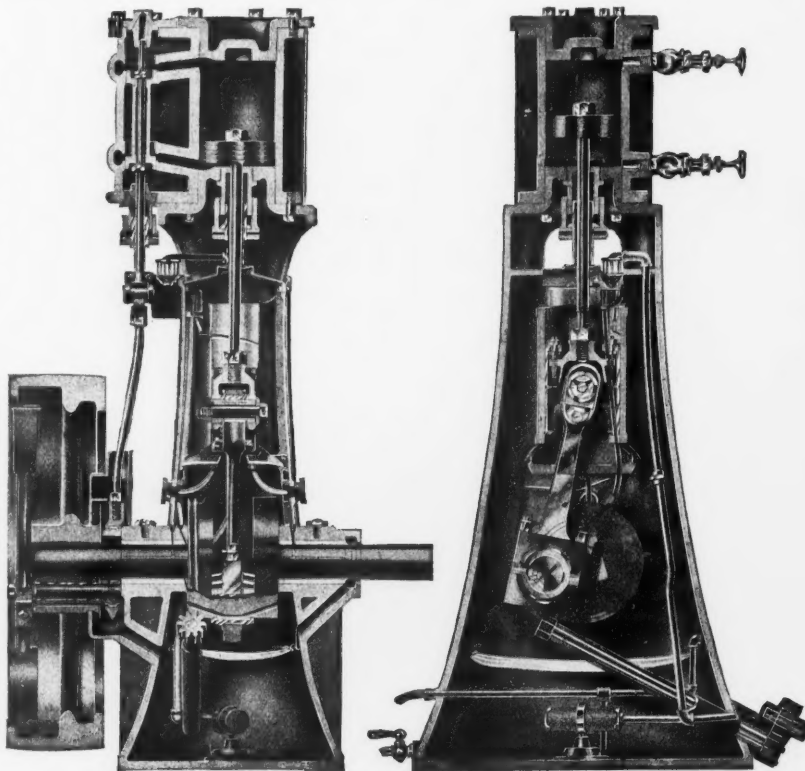
Another source of possible trouble which had to be guarded against is the loosening of core sand from the frame. No matter how much care may be exercised in cleaning a casting, some sand is sure to stick for a while, loosen later and cause serious trouble. To prevent this the frame is painted inside with two coats of thick white enamel. It took a lot of experimenting to get an enamel that would stand the heat, moisture and oil without softening, but it was finally procured.

The pump first adopted was of the plunger type, actuated by an eccentric on the shaft. It was thought too complicated, however, and was abandoned for a gear pump. On the shaft is a large bronze worm with coarse teeth into which meshes a small spur gear attached to a shaft supported at an angle of about 45 deg. The pump gears are within a case attached to the outside of the frame close to the bottom of the base, where they can be gotten at at any time. The discharge pipe from the pump is 0.75 in. diameter, and extends up inside of the frame to the top, where it discharges through a sight-feed glass, so the engineer can easily see if the oil is flowing properly. The oil then empties through a wire screen

into a small tray, through the bottom of which latter project the various oil tubes nearly to the top of same. Each tube has a fine slit cut down the side of it to the bottom of the tray, so as to equalize the flow of oil into them all. In adjusting the engine for this system no bearing should be so tight as to make it impossible to easily slide the connecting rod or shaft along parallel with its axis.

The success attained with these engines, while largely due to the perfection of the oiling system, could not have been attained if it alone had been the only thing carefully developed. First of all, good material of the proper kind has to be used, and all the pins, rods, shafts, piston, valve, crosshead shoes, etc., must be ground on centers to a true diameter and smooth finish. The shaft is a forging with suitable counter weights fastened on. The connecting rod is a drop forging finished bright. The crosshead is cast steel having brass shoes, wedge shaped and adjustable at the top and secured with lock nuts. The crosshead pin is a special composition of a very fine grain and hard enough to take on a very smooth finish. This pin in combination with the brass used will not cut. The brasses have been set up as tight as they could be driven on a dry pin and the engine run all day without the least signs of cutting.

The piston rings are roughed out, cut, drawn together and clamped. They are then ground to the cylinder diameter. The crank pin brasses are lined with the best quality of babbitt metal, peneled in and scraped to a perfect surface. Adjustment of these



Longitudinal Section Through Engine. Transverse Section Through Engine.

brasses is accomplished by two tap bolts turned out of hexagon steel, threaded on the lower ends. Above the nuts the tops of the bolts are turned down to a smaller diameter and threaded again for a lock nut. The two tops are joined together by a yoke-shaped washer which is between the nut and lock nut to prevent either of the bolts working out if one of the lock nuts should loosen.

The flywheel is so designed that the greater part of the weight comes in a plane close to the end of the bearing, thereby relieving to a great extent any strain on the shaft. The inclosing panels are held in place by a single milled thumb screw, thus overcoming the necessity for taking out a dozen or more screws to get off the cover plates.

Every engine is set up, given a day's run under full load, and then taken down, carefully inspected, and if found in a satisfactory condition is reassembled, indicated and adjusted before leaving the shop.

Due to the high speed, small clearance and a well-fitting valve and piston, the steam consumption has been brought down to an average of less than 37 lbs. per h.p.-hr. for a 6-in. by 6-in. engine, with 100 lbs. pressure, when running 500 r. p. m. with full load. It is rare that the same economy is attained with other engines of the same size, as most of them take from 60 to 80 lbs. per h.p.-hr.

GENERAL NEWS SECTION

NOTES.

Sir Thomas G. Shaughnessy announces that the Canadian Pacific proposes to clear 150,000 acres of land on Vancouver Island, with a view to promoting the settlement of the island.

The State Railroad Commission of Indiana has ordered a reduction of 33½ per cent. in freight rates on commercial fertilizers. The order apparently applies to all of the roads of the state.

The Federal government has renewed its prosecution of the Louisville & Nashville for alleged discrimination against employees for belonging to labor unions, and on December 5 the superintendent at Mobile was arrested.

The Southern Pacific is preparing to build a large new hospital in San Francisco, and it is said that land costing \$200,000 has been bought as a site. The company lost a large brick hospital in the great fire of last April.

Railroads centering in Chicago have organized the Illinois Freight Association, to supervise the making of freight tariffs on intrastate shipments. The chairman of the Association is W. H. Hosmer, and Horace Tucker is Secretary.

According to the New York *Herald* certain railroad interests are not satisfied with the bill of Representative Esch, introduced in Congress last year, to require the use of the block system on American railroads, and will have another bill introduced.

Representative Pearre, of Maryland, has introduced in Congress a bill to require railroad telegraph operators handling block signals or dispatchers' orders to be examined by the Interstate Commerce Commission; and to forbid, under severe penalties, the employment of operators not duly licensed.

The State Railroad Commission of Wisconsin, acting on complaints from a number of places, has ordered a reduction of 20 per cent. in freight rates on sugar beets, which applies, it appears, to the whole state; and the railroads must not stipulate more than 15 tons as the minimum carload.

The Brooklyn Rapid Transit Company, operating surface street cars in Brooklyn, N. Y., has enlarged one of its power houses, so that an addition of about 25 per cent. has been made to the number of cars running, thus relieving congestion at the Williamsburg bridge, the Brooklyn bridge and other important points.

The American Railway Association committee to investigate the freight car situation consists of Arthur Hale, Julius Kruttschnitt, F. A. De'ano, Samuel Higgins (N. Y., N. H. & H.), and J. R. Kenly (A. C. L.). The first three members also constitute the committee having in charge the affairs of the Car Hire Agreement.

Leading men in the Republican party of New York City say that at the coming session of the state legislature they expect to secure the passage of a radical railroad bill increasing the powers of the State Railroad Commission and providing for the appointment to the board of men well fitted for the office of commissioner.

A press despatch from Washington says that on January 5 the Southern Railway, on account of increased traffic, and the delays due to the construction of new main tracks, will take off mail train No. 97. By this act the company will lose about \$140,000 annually, which it has received from the government as special compensation for fast time.

The Interstate Commerce Commission has ordered an investigation of the relations between the Union Pacific and Southern Pacific Railway Systems growing out of their common management and control. Messrs. Frank B. Kellogg and C. A. Severance, of St. Paul, have been retained to take charge of the investigation, which will extend from New York to San Francisco. Dates for hearings have not yet been fixed.

According to an Illinois paper passengers on the Illinois division of the Wabash railroad will hereafter be asked to enter trains by the front door and leave by the rear. Success to the effort! The plan to have passengers enter by the rear door and go out at the front has been more or less energetically prosecuted for the past 35 years, and still seems to be about where it was when it was started. Possibly the reversing of the process will bring success.

The Pacific Fruit Express Co., with a capital of \$12,000,000, has been incorporated in Utah by Harriman interests to develop the plan of supplanting Armour refrigerator cars with the company's own cars. It will be recollected that 6,000 refrigerator cars were ordered from the American Car & Foundry Co. for this pur-

pose last September. W. H. Bancroft, Vice-President and General Manager of the Oregon Short Line, is President of the new Company.

Chicago newspapers say that the Illinois Manufacturers' Association and other organizations of shippers have secured what they wanted from the railroads in the way of a negotiable form of bill of lading, and the abrogation or modification of the rule under which many kinds of freight, when carried at carriers' risk, are charged at 20 per cent. above the normal rates. The shippers expect that the railroads will next month adopt a new form of bill of lading which will be satisfactory.

At Danville, Va., on the morning of December 8 about 4 o'clock a passenger train of the Southern Railway collided with a freight train standing on the main track at or near the station, and two men were killed. Several others, including postal clerks and passengers, were injured. Danville is not far from Lawyer, where occurred the disastrous rear collision of passenger trains on November 29, and, according to newspapers, two signalmen and the flagman of the freight who were held blameworthy for this last collision have been arrested and are held on a criminal charge.

Congress will not consider the Sherman two-cent fare proposition for a month or two at least. The House Committee on Interstate Commerce has postponed until January 8 consideration of the bill. In the meantime Representative Mann, of Illinois, will prepare a bill going further than that of Mr. Sherman and fixing two cents per mile as the maximum rate of passenger fare that can be charged on any train. There will probably be brief hearings on the two-cent fare question, but it is not at all probable that any bill affecting passenger fares will become a law during the present session. It is doubtful whether any such bill will even be reported from the House Committee.

Chicago reporters gather that all the railroads centering in that city expect to make general advances in wages about January 1, but they say that the negotiations with the men are not yet finished. At the same time some of the reports continue the old stories of big demands by the men, refusal by the road, and danger of serious strikes. It is reported in New York City that the yard conductors and brakemen throughout the switching district of New York harbor are demanding a large increase of pay, which is thus far refused, but an officer on one of the prominent roads says that the reports that a strike is imminent are not well founded. At Pittsburg the brotherhood of railroad trainmen is making demands on the Baltimore & Ohio, which, it is said, have been refused.

In the United States Court at Salt Lake City the Grand Jury on December 7 presented indictments against the corporations and individuals named below, based on evidence recently brought out by the Interstate Commerce Commission concerning discrimination against coal dealers and alleged illegal methods employed in acquiring coal lands: Union Pacific Railroad; Union Pacific Coal Company; Oregon Short Line; Everett Buckingham, General Superintendent of the Oregon Short Line; James N. Moore, General Sales Agent of the Union Pacific Coal Company; H. G. Williams, General Manager of the Utah Fuel Company; Robert Forrester, geologist for the Utah Fuel Company; William D. Foster; George A. Moore; Elroy H. Clark; Alexander Cawie; P. W. Spaulding, Union Pacific attorney at Evanston, Wyo.; and Theodore Schulte, of Salt Lake.

A suit has been begun in the United States Circuit Court by D. W. Burrows, of Chicago, to have declared illegal the formation of the Metropolitan Securities Company, of New York, the defendants being the Interborough-Metropolitan Company, the Interborough Rapid Transit Company, the Metropolitan Street Railway Company, the Metropolitan Securities Company, the Manhattan Railway Company, the New York City Railway Company, Thomas F. Ryan, August Belmont, Cornelius Vanderbilt, Edward J. Berwind, John D. Crimmins, Andrew Freedman, Thomas P. Fowler, Gardiner M. Lane, F. S. Gannon, R. W. Meade, Orin Root, Jr., Edward W. Sayre, H. H. Vreeland and Charles E. Warren. The complaint alleges that the merger of these interests is tantamount to a conspiracy in restraint of trade, and as a holder of 1,400 shares of stock in the Metropolitan Securities Company he asks that the combination be dissolved.

Congestion of freight continues general, and instances of obstruction, delay and serious inconvenience are literally too numerous to mention. The last two items published are from Burlington, Vt., and Goldfield, Nev., indicating the wide extent of the trouble. At Burlington the quantity of lumber brought from Canada by canal boats is larger than before for 10 years, and lumber yards are congested because cars cannot be found in which to ship it. At Goldfield, where freight is piling up hopelessly, the volume has doubled

in two months. A third item from another corner of the country, Florida, shows what is going to be done about it. The railroad commissioners of that state have fined the Seaboard Air Line \$1,000, for not supplying shippers with cars, and threaten to pile up fines against all offending railroads "until they shall awaken to the realization that they must either supply themselves with cars or be swamped with fines."

Fines for Sugar Rebates \$312,000.

On Thursday last Judge Holt in the United States Court imposed fines aggregating \$150,000 on the American Sugar Refining Company and the Brooklyn Cooperage Company for accepting rebates on sugar shipped to Detroit in 1902. Up to and including this decision, Judge Holt has imposed fines for illegal rates on sugar shipments aggregating \$312,000, namely: New York Central & Hudson River Railroad, \$108,000 and \$18,000; F. L. Pomeroy, Freight Traffic Manager, \$6,000; Goodloe and Earle, sugar jobbers of Detroit, \$12,000; American Sugar Refining Company, previously \$18,000. Messrs. Goodloe & Earle pleaded guilty December 10, and promptly paid their fines. These last fines of \$150,000 followed pleas of guilty made December 11. Judge Holt, in passing sentence, said that the law did not contemplate excessive fines, and United States Attorney Stimson agreeing that the fines imposed would probably be large enough to deter rebaters in the future, consented to suspend action on other indictments pending against the defendants. The New York Central did not plead guilty, and it is supposed that it will appeal to the higher court.

Electric Traction on the New York Central.

The New York Central is now running daily eight trains into the Grand Central Station and eight out, by electric power. This service was begun December 11. The trains run on the Hudson division to and from Yonkers, 15 miles, and the electric power is used between the terminal and High Bridge, six miles. These trains run into the old station on the old tracks, which have been fitted with the third rail. On December 13 all of the trains of the Harlem division began to run to and from the new temporary terminal at the east side of the enlarged yard. These trains, however, are propelled by electric power only within the yard limits, steam engines being attached and detached just south of the tunnel. This temporary passenger station is on Lexington avenue between 43d and 44th streets, in the basement and first story of the "Grand Central Palace."

Extension of Elevated Railroad Runs.

The trains of the Manhattan Elevated Railroad of New York City, west side division, are to run through to High Bridge across the Harlem river. The northern terminus of the elevated line is at 155th street, which is the southern terminus of the Putnam division of the New York Central, and passengers change from one road to the other at that point. With the extension of the runs of the elevated trains northward, one mile, to High Bridge, the runs of the New York Central trains will be shortened to the same extent, and High Bridge will become the operating terminus for both roads. By this extension of the trips of the elevated trains a large number of passengers going downtown in the morning and uptown at night will save the time heretofore taken up in changing cars at 155th street.

TRADE CATALOGUES.

Electric Hoists.—The Sprague Electric Company, New York City, sends a folder calling attention to several types of electric hoists and cranes made by the company. The illustrations show different combinations of the hoists for cranes, winches and winding drum hoists.

Vises.—The Fulton Machine & Vise Company, Lowville, N. Y., sends an illustrated catalogue and price list of swivel vises. Wood working and malleable pipe vises are also shown.

Manufacturing and Business.

The American Car & Foundry Co.'s new steel car plant at Madison, Ill., is in operation and is turning out from 40 to 50 cars daily.

H. A. Flagg has been appointed Manager of Sales in charge of the New York office of the Shelby Steel Tube Company of Pittsburgh, Pa.

The car department of the Lower Allegheny works of the Pressed Steel Car Co. recently closed down because of slow deliveries of steel.

The Central Inspection Bureau, New York, has an order from the American Railways Co. to inspect 10 truck cars to be built at the Jewett Car Co.

The St. Louis Car Company has increased its capital stock from \$2,500,000 to \$3,000,000, the additional stock being taken by the

President of the company, G. J. Kobusch. The proceeds of the sale are to be used for improvements.

Nathaniel Haven has resigned as President of the Baltimore Bridge Co., which concern he organized five years ago. Before his connection with the Baltimore Bridge Co. Mr. Haven was for some years with the Union Bridge Co., now a part of the American Bridge Co. of New York.

A dividend of $\frac{1}{2}$ of 1 per cent. has been declared payable January 1, 1907, on the \$30,000,000 outstanding common stock of the American Car & Foundry Co., being the first dividend on this stock since 1904. The annual rates have been as follows: 1900, 1 per cent.; 1901 and 1902, 2 per cent.; 1903, 4 per cent.; 1904, $\frac{1}{2}$ of 1 per cent.

The Midvale Steel Company, Philadelphia, has ordered from the Allis-Chalmers Company a heavy duty cross compound engine, with cylinders 30 in. and 46 in. x 48 in., for direct-connection to an electric generator, to be installed in its plant at Nicetown, Pa. The engine is to be operated non-condensing and the normal capacity of the unit will be 1,000 k.w.

Fitzhugh Townsend, instructor in the electrical engineering department of Columbia University, died at his home in New York City, December 11, of typhoid fever. Prof. Townsend was consulting engineer to the General Railway Signal Co., in connection with the signal installations now being made by that company on the New York Central and the New York, New Haven & Hartford.

Adreon & Co., St. Louis, Mo., have established an office in Chicago, with Edw. W. Hodgkins, Vice-President of the company in Chicago, in charge. The L. J. Bordo Co., Philadelphia, Pa., maker of Bordo blow-off valves and Bordo swing joints, of which Mr. Hodgkins is also Vice-President, has established a general western sales office in Chicago with Mr. Hodgkins in charge. His office will be 208 Western Union Building.

The directors of the Union Switch & Signal Company have declared a quarterly dividend of 3 per cent. on the \$497,600 preferred stock, and a quarterly dividend of 3 per cent. on the \$1,748,700 common stock. The annual rates on the preferred stock have been: 10 per cent. in 1904, 1905 and 1906; 9 per cent. in 1903 and 8 per cent. in 1902 and 1901. The annual rates on the common stock have been: 8 per cent. in 1904, 1905 and 1906; 6 per cent. in 1903 and 4 per cent. in 1902 and 1901.

N. P. Rogers, Secretary and Treasurer of the Haskell & Barker Car Company, Michigan City, Ind., died in Tucson, Ariz., on December 1. He was 68 years old, having been born in Plymouth, N. H., in 1838. He had been with the Haskell & Barker works since 1864, when he began as accountant. In 1871, when the Haskell & Barker Car Company was organized, he was made Secretary. He was given also the duties of Treasurer in 1883, at the time of the retirement of H. T. Haskell; he held the joint office until his death.

The American Car & Equipment Co., Chicago, has completed negotiations for the erection of a new plant. It will be located at Chicago Heights, Ill., and will cover 23 acres. The plant will include a large freight car erecting shop, coach shop, mill building, machine shop, power house and locomotive erecting shop; all buildings will be new. Plans are being drawn by Huehl & Schmidt, architects, Chicago, and grading for the plant and installation of tracks has been begun. The work is being done under the supervision of C. R. Powell, Vice-President of the company. The headquarters of the company have been removed from 936 The Monadnock to 1537 and 1538 The Monadnock, Chicago, where much larger offices are occupied.

Iron and Steel.

The South & Western has given orders to the Pennsylvania Steel Co. for 6,900 tons of fabricated steel for bridges, and to the King Bridge Co. for 600 tons. The New York Central has given orders for 1,600 tons of structural material for station work, and will shortly let contracts for several thousand tons additional. The Chicago, Milwaukee & St. Paul has ordered 600 tons of fabricated steel; the Lehigh Valley 900 tons; the Pennsylvania Railroad an additional order for 200 tons, and the New York, New Haven & Hartford 300 tons. The Brooklyn Heights Railroad is still in the market for 5,000 tons of fabricated steel for elevated work. Another contract for about 2,500 tons of steel is pending for a Scherzer bridge of two 100-ft. spans for Fall River.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Franklin Institute.

At a meeting of the Sections, December 13, the programme included an address on "The Manufacture of Railway Car Axles," by Henrik V. von Z. Loss.

Engineers' Club of Philadelphia.

At a meeting of this club to be held December 15 there will be a paper on "Bascule Bridges and the Construction of Arched Bridges Without Falsework" by J. B. Strauss.

ELECTIONS AND APPOINTMENTS.**Executive, Financial and Legal Officers.**

Ashland & Western.—The officers of this road are as follows.—Z. W. Davis, President; H. B. Stewart, Vice-President; R. N. Raff, Secretary; William Simpson, Treasurer; Z. T. Herndon, Chief Engineer, all with offices at Canton, Ohio, and J. W. Brown, Auditor, with office at Ashland, Ohio.

Chicago, Burlington & Quincy.—C. G. Burnham, Foreign Traffic Agent, has been appointed Assistant to the First Vice-President.

Chicago, Cincinnati & Louisville.—See Wisconsin Central.

Cincinnati, Georgetown & Portsmouth.—A. O. Herzog, Secretary, has been elected also Treasurer.

Cincinnati, Hamilton & Dayton.—F. A. Deverell has been appointed Auditor of Disbursements.

New Orleans & Northeastern.—D. D. Curran, General Manager, has been elected also Vice-President of this road and of the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific.

Wisconsin Central.—Henry C. Starr, Vice-President and General Counsel of the Chicago, Cincinnati & Louisville, has been elected Vice-President and General Attorney of the Wisconsin Central, succeeding Howard Morris, resigned.

Operating Officers.

Baltimore & Ohio.—Charles W. Galloway, who was recently appointed Superintendent of Transportation, has done all his railroad work on the B. & O. His present position was created because of the need of an assistant to the General Superintendent of Transportation, most of whose time is now taken up by his service as a member of the new Car Hire Committee. Mr. Galloway was born in 1868, and began railroad work in 1883 as a messenger boy. He served as clerk and stenographer to the Master of Transportation, then to the Manager and finally to the General Superintendent. He was secretary, successively, to the Superintendent of Car Service, the Superintendent of Transportation and



C. W. Galloway.

the General Superintendent. In 1897 he was appointed trainmaster of the Baltimore division, and two years later was made Assistant Superintendent of the First division. In 1901 he was appointed Superintendent of the Cumberland division, and since 1903 he has been Superintendent of the Baltimore division.

Cincinnati, Georgetown & Portsmouth.—E. W. White has been appointed General Manager and General Freight and Passenger Agent, with office at Cincinnati, Ohio.

Colorado & Southern.—S. S. Morris has been appointed Superintendent of the Northern division, with office at Denver, Colo.

Denver, Enid & Gulf.—G. C. Starkweather is Acting General Manager, with office at Enid, Okla. T.

Lake Shore & Michigan Southern.—Orin C. Smith has been appointed Car Accountant, with office at Cleveland, Ohio.

Louisiana & Northwest.—P. L. Mackey has been appointed Superintendent, with office at Magnolia, Ark., succeeding W. R. Haynes, resigned.

Louisville & Nashville.—J. M. Scott has been appointed Assistant Superintendent of the Louisville, Cincinnati & Lexington division, with office at Louisville, Ky.

Midland Valley.—G. S. Russell, Car Accountant, having been assigned to other duties, his former position has been abolished. C. E. Mandeville has been appointed Superintendent of Car Service.

Trinity & Brazos Valley.—W. O. Hamilton has been elected Treasurer, succeeding F. P. West, resigned.

Traffic Officers.

Bangor & Aroostook.—C. C. Brown, General Freight Agent, has resigned to go to the Morse Steamship Lines.

Canadian Northern.—George Stephen has been appointed Assistant General Freight Agent and C. W. Cooper Assistant General Passenger Agent, both with offices at Winnipeg, Man.

Cleveland, Cincinnati, Chicago & St. Louis.—See New York Central Lines.

Colorado Springs & Cripple Creek District.—D. C. MacWatters, General Passenger Agent, has resigned, effective January 1.

New York Central Lines.—George J. Grammer, who was recently elected Vice-President in charge of freight traffic of all the



G. J. Grammer.

New York Central Lines, was born in 1845 in Ohio. After several years' experience on western river steamship lines, he began railroad work, in 1881, as General Freight and Passenger Agent of the Evansville & Terre Haute. He was made Traffic Manager of that road and of the Evansville & Indianapolis two years later, and in 1886 was made General Traffic Manager of the two roads. Later his authority was extended over the Peoria, Decatur & Evansville, the Louisville, Evansville & St. Louis, and the Chicago & Eastern Illinois. In 1892 he was elected President of the Evansville & Terre Haute, the Evansville & Indianapolis, and the Evansville & Richmond. In 1894 he went to the Chesapeake, Ohio & Southwestern as General Manager, and, a few months later, was made General Freight Agent of the Lake Shore & Michigan Southern. He was appointed General Traffic Manager of the last named road in 1896, and in 1905 was elected Vice-President in charge of the New York Central Lines west of Buffalo, where he has been until his recent appointment. It is interesting to notice that the authority of Mr. Grammer and the three new Vice-Presidents extends over the New York, Chicago & St. Louis, which heretofore has been operated under an almost entirely separate organization.

Charles F. Daly, who was elected Vice-President in charge of passenger traffic of all New York Central Lines, was born in 1865 and began railroad work in 1878 as a telegraph operator on the Chicago, Burlington & Quincy. Until 1888 he was passenger and ticket agent at various points on that road, going finally into the General Passenger Agent's office; he then went to the Lake Erie & Western as chief clerk to the General Passenger and Ticket Agent. The next year he was made Assistant General Passenger Agent, and in 1890 was appointed General Passenger Agent. He was appointed Chief Assistant General Passenger Agent of the Lake Shore & Michigan Southern in 1902, and in 1905 was made Passenger Traffic Manager of that road and of the Michigan Central and the Lake Erie & Western. Since December, 1905, he has been Passenger Traffic Manager of the lines east of Buffalo.



C. F. Daly.

Ira A. Place, who has been made Vice-President in charge of legal matters on lines east of Buffalo, graduated from Cornell University in 1881. He began to study law in Syracuse in the office of the firm of Vann & McLennan, who were local attorneys for the New York, West Shore & Buffalo, then being built. Mr. Place was admitted to the bar in 1883, and then went to New York City with P. B. McLennan, General Counsel for the New York, West Shore & Buffalo. The West Shore soon went into a receivership, and when it was reorganized and leased to the New York Central & Hudson River, in 1886, Mr. Place was made Assistant to the General Counsel of the last named company. He was later made Chief Assistant to the General Counsel, and in 1902 was made General Attorney, being at the head of the legal department.



Ira A. Place.



Albert H. Harris.

Harris is a trustee of several corporations in Rochester, and is a Director of the Rochester Railway.

Albert H. Harris, who has been elected Vice-President in charge of legal matters on the lines west of Buffalo was born in 1861 at Rochester, N. Y. He graduated from the University of Rochester in 1881, and began to practice law in that city in 1884. His practice was largely in connection with corporations, and he was for some time local counsel for the New York Central & Hudson River. He left an important practice in 1905 to go to New York as General Attorney of the New York Central, where he remained until his recent promotion. Mr.

New York Central.—B. B. Mitchell, Freight Traffic Manager of the lines west of Buffalo, has been appointed Freight Traffic Manager of the lines east of Buffalo, succeeding F. L. Pomeroy, deceased. George H. Ingalls, General Freight Agent of the Cleveland, Cincinnati, Chicago & St. Louis, succeeds Mr. Mitchell, with office at Chicago, Ill.

San Pedro, Los Angeles & Salt Lake.—Frederick W. Wann, formerly Vice-President of the Cincinnati, Hamilton & Dayton, has been appointed General Traffic Manager of the San Pedro, Los Angeles & Salt Lake.

Engineering and Rolling Stock Officers.

Algoma Central & Hudson Bay.—K. J. C. Zinck has been appointed Engineer of Maintenance of Way and Construction.

Central of Georgia.—F. F. Gaines, heretofore Mechanical Engineer of the Philadelphia & Reading, has been appointed to the new office of Superintendent of Motive Power of the Central of Georgia.

Eric.—William Schlafge, Master Mechanic of the New York division, has been appointed Master Car Builder at Meadville, Pa., succeeding R. W. Burnett, resigned. J. J. Dewey, Master Mechanic of the Cincinnati division, succeeds Mr. Schlafge, with office at Jersey City, N. J. C. James, Master Mechanic of the Rochester division, succeeds Mr. Dewey, with office at Galion, Ohio. D. Van Riper, general foreman of the Meadville shops, succeeds Mr. James, with office at Avon, N. Y. G. A. Moriarity, general foreman of the Port Jervis shops, has been appointed Master Mechanic of the Delaware division, with office at Port Jervis, N. Y.

Harriman Lines.—The office of J. D. Isaacs, Consulting Engineer, has been removed from San Francisco to Chicago.

New York Central & Hudson River.—W. J. Crandall, road-foreman of engines, has been appointed to the new office of Master Mechanic at Syracuse, N. Y., in charge of that part of the Western division from Syracuse west to and including Rochester.

Oregon Short Line.—See Union Pacific.

Philadelphia & Reading.—W. G. Edmondson, Engineer of Tests, has been appointed Mechanical Engineer, succeeding F. F. Gaines, resigned. See Central of Georgia.

Southern Pacific.—Howard Stillman, heretofore Engineer of Tests, has been appointed Mechanical Engineer succeeding F. W. Mahl, resigned to go to another company.

Union Pacific.—R. B. Robinson has been appointed Division Engineer of the Utah division of the Oregon Short Line and of the Wyoming district of the Union Pacific lines west of Green river, with office at Salt Lake City, Utah, succeeding H. J. Harris, resigned.

LOCOMOTIVE BUILDING.

The Illinois Central has ordered 50 locomotives.

The Chicago, Milwaukee & St. Paul has ordered two compound Atlantic (4-4-2) type locomotives from the Baldwin Locomotive Works.

The Commonwealth Oil Company, Sydney, New South Wales, has ordered a locomotive from the Lima Locomotive & Machine Company.

The Stratford Railway Construction Co., Lima, Ohio, has ordered one mogul (2-6-0) locomotive from the Hicks Locomotive & Car Works.

CAR BUILDING.

The Illinois Central has ordered 500 cars.

The Pennsylvania is reported to be asking bids on 5,000 or more freight cars.

The Seaboard Air Line, it is reported, is about to build 50 flat cars at its Portsmouth, Va., shops.

The Colorado & Southern is reported to have ordered 2,200 box cars from the Pullman Company.

The Buffalo, Rochester & Pittsburg is reported to have ordered 500 box cars from the American Car & Foundry Co.

The Lehigh Valley is reported to have ordered 1,000 box cars from the Standard Steel Car Co., and 4,000 coal cars.

The Tonopah & Goldfield is said to be asking bids on from 100 to 200 drop bottom wooden coal cars of 80,000 lbs. capacity.

The Chicago, Lake Shore & Eastern has ordered 350 steel underframe gondola and 100 steel underframe flat cars from the American Car & Foundry Co.

The Missouri, Kansas & Texas, it is reported, will soon place an order for a large number of steel coal cars and probably for some steel underframe box cars.

The Bolivia Railways Company has ordered 50 steel underframe flat and 30 steel underframe box cars of 60,000 lbs. capacity, and eight tank cars and four cabooses from the Middletown Car Works.

The Indianapolis, Crawfordsville & Western Traction Co., Crawfordsville, Ind., has ordered through the Electrical Installation Co., Chicago, eight interurban cars and two express cars from the Jewett Car Company.

The Harriman Lines have ordered five dining cars for the Southern Pacific, two dining cars for the Louisiana Western, one dining car for Morgan's Louisiana & Texas, and one dining car for the Texas & New Orleans from the Pullman Co.

The Chicago, Rock Island & Pacific is asking bids on 103 box cars of 80,000 lbs. capacity, 35 coal cars of 100,000 lbs. capacity, 18 stock cars of 80,000 lbs. capacity, three furniture cars of 60,000 lbs. capacity, and three flat cars of 100,000 lbs. capacity.

The Wabash, as reported in our issue of November 16, has ordered 2,000 steel hopper cars from the Standard Steel Car Co., 2,000 steel hopper cars from the Cambria Steel Co., 1,000 wooden box cars from the American Car & Foundry Co. and 1,000 wooden box cars from the Pullman Co.

The Indianapolis, Columbus & Southern Traction, as reported in our issue of December 7, has ordered three interurban cars from the Niles Car & Manufacturing Company for May, 1907, delivery.

These cars will weigh 60,000 lbs., and will measure 50 ft. long, 8 ft. 10 in. wide, over all, and 10 ft. high from bottom of sill to trolley board. The special equipment includes: Peter Smith heating system and Baldwin trucks.

The Philippine Railway is having built at the Middletown Car Works fifty 3-ft. 6-in. gage, 40-ton flat cars, which are to be delivered January 1, 1907. These cars will weigh 28,000 lbs., and will measure 35 ft. long, 8 ft. wide and 3 ft. 7½ in. high, all over all measurements. Bodies and underframes will be of wood. The special equipment is M. C. B. standard, except as follows:

Bolsters	Riveted box girder
Brake-beams	Buffalo I
Brakes	Westinghouse
Couplers	Janney-Kelso
Draft rigging	Miner tandem
Dust guards	Wooden
Trucks	Diamond frame; arch bar

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARKANSAS SOUTHERN.—See Chicago, Rock Island & Pacific.

ATLANTIC & NORTHERN CAROLINA.—See Norfolk & Southern.

ATLANTIC COAST LINE.—On the third division of this road the Newberry branch has been extended from Newberry, Fla., west to Wilcox, 20 miles.

BIRMINGHAM SOUTHERN.—According to reports from Birmingham, Ala., this company will shortly let contracts for extending its road five miles to new mines.

CANADIAN NORTHERN.—This company is applying to Parliament for permission to extend its line from Edmonton to Calgary, from Regina to the international boundary, from Edmonton west via the Yellow Head Pass to the Pacific coast, from Strathcona south to Calgary, from Saskatoon south to the South Saskatchewan river and from Athabasca southwest to the headwaters of the McLeod river.

The Ridgeville section of this road has been opened for business from South Junction, Man., west to Emerson Junction, 23 miles.

A new branch, known as the Thunderhill branch, has been opened for business from Thunderhill Junction, Man., west 20.1 miles to a point 1.3 miles beyond Benito.

CANADIAN PACIFIC.—This company will ask to be allowed to build new lines in Saskatchewan and Alberta as follows:

From a point in Township six, seven, eight or nine, Range 30, west of the second principal meridian, west to a connection with the Crow's Nest Pass Branch between Range 16 west of the fourth principal meridian and Lethbridge, about 350 miles.

From a point on the proposed revision of the Crow's Nest Pass branch in Township 10, Range 23 or 24 west of the fourth principal meridian, north to a point in Township 15, 16, 17 or 18, Range 22, 23 or 24, west of the fourth principal meridian, about 50 miles.

And to build a branch from Earl Grey or Bulyea on its Pleasant Hills branch, Saskatchewan, or from some point between those places, southwest to a point in Township 20 or 21, Range 21, west of the second meridian.

The Reston branch of the Central division of this road from Reston, Man., west to Kaiser, 98.2 miles has been opened for business.

The Guelph branch of the Ontario division has been extended from Elmira, Ont., 18 miles, west to Milverton.

CHESAPEAKE & OHIO.—This company has opened for business its White Oak branch from White Oak Junction, W. Va., to Scarbro, two miles, where connection is made with the White Oak Railway for Stuart.

CHICAGO, MILWAUKEE & ST. PAUL.—Announcement has been made by this company of the route of its proposed extension from Butte, Mont., west to the Pacific coast, a description of which is given elsewhere in this issue.

CHICAGO, ROCK ISLAND & PACIFIC.—According to reports from Denver, this company is planning an independent entrance into this city by building a new line from Limon to Colorado Springs, and thence to Resolis, about 10 miles west of Limon; from this point the surveys run northwest about midway between the Union Pacific and the Colorado & Southern lines, to a connection with the latter at Melvin, 10 miles southeast of Denver, from which point it is proposed to use the Colorado & Southern tracks into the city. Such a line would necessitate laying about 60 miles of track.

The Rock Island, Arkansas & Louisiana division of this road has been extended from Winfield, La., south to Wirand, 9.30 miles. See Oklahoma & Canadian River.

COLORADO & SOUTHERN.—The Wichita Valley has been extended from Seymour, Tex., west to Stamford, 60.7 miles.

DELAWARE & EASTERN.—This company not long ago put in operation its road from East Branch, N. Y., on the New York, Ontario & Western, northeast to Arkville on the Ulster & Delaware, 37 miles. It appears that there are plans for extending the road in both directions, so as to make it a connecting line between the anthracite

coal regions of Pennsylvania and Schenectady, where it would meet lines running into New England. The northern extension to Schenectady is to be built by the Schenectady & Margaretville Railroad; part of the southern extension, by the Hancock & East Branch. On December 11 the New York State Railroad Commission granted permits to each of these companies to build their lines. On completion of both extensions the road would be a through line from Wilkesbarre, Pa., to Schenectady, N. Y.

DENVER, ENID & GULF.—This company is now operating its new line from Kiowa, Kan., north to Madison Lodge, 20 miles.

DULUTH & NORTHERN MINNESOTA.—This road has been extended from North Branch Junction, Minn., north to Schauff Lake, 12.4 miles.

FOURCHE RIVER VALLEY & INDIAN TERRITORY.—This road has been opened for business from Fourche, Ark., which is on the Chicago, Rock Island & Pacific, west to Bellevue, 18.4 miles.

GAINESVILLE MIDLAND.—This road has been extended from Jefferson, Ga., south to Athens, 19 miles.

GREAT NORTHERN.—On the Minot division of this road the Thorne line has been extended from Thorne, N. D., to Dunseith, seven miles.

GULF, COLORADO & SANTA FE.—It is reported that this company will build a line from Winnie, on its Gulf & Interstate division, to Houston, about 60 miles.

HANCOCK & EAST BRANCH.—See Delaware & Eastern.

HOUSTON, SABINE & RED RIVER.—The franchises and rights of this company, building a line from Houston, Tex., to Alexandria, Pa., have been sold to a syndicate of New York capitalists. It is stated that the new owners will build the road in accordance with the plans of the original promoters. (July 6, p. 5.)

HUNTINGTON & BROAD TOP MOUNTAIN.—This company has opened for business its Six-Mile Run branch, from Riddlesburg, Pa., to Coal-dale.

ILLINOIS, IOWA & MINNESOTA.—This company has completed track laying between Rockford and Aurora, Ill., and is planning to at once build a new line from Aurora to Joliet.

INDIAN CENTRAL.—E. D. Chadick of Paris, Tex., is promoting the building of this line from Palestine, Tex., to Claremore, Ind. T. It is said that the town of McAlester, Ind. T., has agreed to give a bonus of \$100,000 to the new road in consideration of which the shops and general offices of the road are to be located there.

LOUISVILLE & NASHVILLE.—This company has opened for business a new branch on its Atlanta division from Etowah, Tenn., south to Junta, Ga., 88 miles.

MINNEAPOLIS & RAINY RIVER.—This company's road now extends on the main line from Deer River, Minn., via Jessie Junction and Marcell Junction, to Big Fork, 30.2 miles, with a branch from Jessie Junction to Bass Lake, 17.8 miles; also one from Marcell Junction to Marcell, formerly Turtle Lake, 1.7 miles.

MINNESOTA & INTERNATIONAL.—See Northern Pacific.

MISSOURI PACIFIC.—Grading work on the Springfield Southwestern, under which name this company is building a branch from Springfield, Mo., southwest to Crane, on the White River Division has been completed. It was done by the Willier Construction Company, and track laying is to be started at once. Contracts were recently let for grading and construction work near and in the city of Springfield, where the company will have extensive terminals. The first contract for grading the right of way west two miles was given to R. N. Bush, a former sub-contractor of the Willier Construction Co., the work to be completed by February 15 of next year. The other contract is for work within the city of Springfield. It includes a cut 20 ft. deep, mostly through solid limestone, and was given to A. N. Hanson of Springfield.

NATCHEZ, COLUMBIA & MOBILE.—This road has been extended from Old Camp, Miss., formerly Roonville, to Loweton, 5.5 miles.

NEW YORK, NEW HAVEN & HARTFORD.—Announcement is made that the Providence division of this road is to be four-tracked throughout to accommodate the increased traffic. About half of the division is already four-tracked, leaving some 20 miles to be completed. This improvement, with the completion of the tunnel from East Providence to the passenger station in Providence, will relieve the present congestion through Pawtucket. The tunnel will also permit the operation of electric cars between Fall River and Providence union station, and may be used for a through all-rail passenger service between New York and Newport by way of Fall River.

NORFOLK & SOUTHERN.—The Atlantic & North Carolina has been extended from Moorhead City, N. C., to Beaufort, four miles.

NORTHERN PACIFIC.—A contract is reported let by this company to Doherty & Dempsey of Bemidji, Minn., to extend the Minnesota & International from Big Falls northeast to International Falls, 37

miles. The road follows an old survey to Bear Creek, from which point the new survey has been made. The contract calls for the completion of the work by July of next year.

OKLAHOMA & CANADIAN RIVER.—Incorporated in Oklahoma with \$7,350,000 to build a line from the Rock Island at El Reno, Okla., northwest to Meade, Kan., also on the Rock Island. The line would run about 245 miles through the counties of Canadian, Kingfisher, Blaine, Dewey, Woodward and Beaver in Oklahoma, and Clark and Meade in Kansas. The estimated cost of the work is \$6,125,000. The incorporators include E. E. Blake, H. B. Low and C. O. Blake, of El Reno, and P. E. Walker and M. A. Low, of Topeka. It is believed that the new company has been organized in the interest of the Rock Island.

OREGON SHORT LINE.—This company has opened for business the Wellsville branch on the Utah division, from Mendon, Utah, east to Logan Junction, 15 miles.

PARAGOULD SOUTH-EASTERN.—See St. Louis South-western.

ROCHESTER-CORNING-ELMIRA TRACTION.—The New York State Board of Railroad Commissioners has denied the application of this company for a certificate of necessity to construct an electric line from Rochester to Elmira.

ST. LOUIS SOUTH-WESTERN.—The Paragould South-eastern has been extended from Chickasawba, Ark., to Blythesville, one mile.

SAVANNAH, AUGUSTA & NORTHERN.—This company has applied in Georgia for a charter to build a line from Savannah, Ga., northwest via Statesboro, Louisville and Athens to Rossville, on the Central of Georgia opposite Chattanooga, Tenn., 330 miles air line; also from a point on its proposed line in McDuffie county east through the counties of Columbia and Richmond to Augusta, about 30 miles additional. The incorporators include J. A. Brennan, J. R. Miller, R. F. Donaldson, E. B. Sorrier, S. L. Moore, of Bulloch county, Georgia, and E. M. Rice, of New York City.

SCIENECTADY & MARGARETSVILLE.—See Delaware & Eastern.

SOUTHERN.—The Stoneville branch, on the Birmingham division of this road, has been extended from Delta City, Miss., 5.5 miles, to Richey, and a new branch on the same division has been opened for business from Itta Bena, Miss., south to Belzoni, 26.8 miles.

SOUTHERN PACIFIC.—This company is running a daily train between San Francisco and Napa, via Tiburon, over the California North-western to Wingo, thence over its own line to Napa and Calistoga. By the new line the running time between San Francisco and Napa is reduced 38 minutes.

SPOKANE INTERNATIONAL.—This company has opened its road for freight traffic from Coeur d'Alene Junction, Idaho, which is 21 miles east of Spokane, northeast via Sand Point and Bonner's Ferry to Eastport, on the Canadian border, 120 miles.

SPRINGFIELD SOUTH-WESTERN.—See Missouri Pacific.

WICHITA VALLEY.—See Colorado & Southern.

WILKESBARRE & HAZLETON (ELECTRIC).—The stockholders of this company have decided to increase its bonded debt \$500,000, to be used for terminal improvements in Wilkesbarre and in Hazleton.

YOSEMITE VALLEY.—This company has extended its road from Pleasant Valley, Cal., 12 miles, to Bagby.

YOUNGSTOWN & OHIO RIVER.—This company is making surveys for a new route from West Point to the Ohio river via Cannon's Mills and Calcutta to East Liverpool. R. W. Randolph of Pittsburg is in charge of the work.

RAILROAD CORPORATION NEWS.

CANADIAN PACIFIC.—The President of this company has brought action against F. A. Heinze to compel him to select one-half of the 750,000 acres of land owned by the Columbia & Western. This road, which runs from Robson to Midway, B. C., 100 miles, was built by Mr. Heinze and bought by the Canadian Pacific, Mr. Heinze retaining a half interest in the lands. The Canadian Pacific, it is now said, wants to sell its half interest, and therefore the action has been brought as above.

CITY ELECTRIC RAILWAY (ROME, GA.).—See Rome Railway & Light.

COLUMBIA & WESTERN.—See Canadian Pacific.

CUMBERLAND VALLEY.—See Pennsylvania.

GREAT NORTHERN.—Announcement has been made that this company is to offer \$60,000,000 additional stock at par to holders of record on January 4, 1907, to the extent of 40 per cent. of their present holdings. There is now outstanding \$149,563,690 stock and the proceeds of the new issue are to be used for new equipment, improvements, extensions and the acquisition of new lines.

GREAT NORTHERN OF CANADA.—The main line of this road between

Quebec and Montreal has been seized under a writ of attachment as a result of judgments given in favor of the Royal Trust Company, which sued the railroad for interest on the bonds issued by the Great Northern Elevator Company. An elevator was built in Quebec and leased by the railroad, which endorsed \$300,000 bonds issued by the Elevator Company. The seizure does not affect the operation of the road and the railroad company will appeal the case.

NEW YORK CENTRAL LINES.—Gross earnings for the month of November were as follows:

	1906.	Change.
New York Central & Hudson River	\$8,082,340	Inc., \$448,552
Lake Shore & Michigan Southern	3,435,556	Inc., 24,115
Lake Erie & Western	415,402	Dec., 56,152
Chicago, Indiana & Southern	202,666	Inc., 13,401
New York, Chicago & St. Louis	806,107	Inc., 52,488
Michigan Central	2,352,133	Inc., 184,274
Cleveland, Cincinnati, Chicago & St. Louis.	2,056,894	Inc., 1,168
Peoria & Eastern	253,781	Dec., 58,271
Cincinnati Northern	82,194	Inc., 13,659
Pittsburg & Lake Erie	1,261,897	Inc., 48,733
Rutland	233,420	Inc., 18,945
	\$19,182,390	Inc., \$690,912

NORFOLK & WESTERN.—This company is about to offer to stockholders the right to subscribe to a block of the \$34,000,000 convertible bonds, recently authorized, to the extent of one-sixth of their present holdings of stock. There are outstanding \$64,469,200 common stock and \$22,991,100 preferred stock, so that about \$14,576,000 bonds will be issued.

NORTHERN CENTRAL.—The directors have declared a stock dividend of 12½ per cent. on the \$17,193,400 outstanding capital stock. A movement was started by the minority stockholders last August towards getting a larger distribution of profits on this stock. The annual dividend rate since 1901 has been 8 per cent.

PENNSYLVANIA.—This company is offering three shares of its stock for each share of any class of Cumberland Valley stock. The offer is made on the condition that nearly all holders of Cumberland Valley stock assent to the proposal. The Pennsylvania already owns \$975,850 of the \$1,292,950 common stock, and large amounts of the first and second preferred.

PHILIPPINE RAILWAY.—A syndicate headed by William Salomon & Co., New York, has been formed to underwrite \$15,000,000 4 per cent. 30-year bonds of this company, the interest to be guaranteed by the Philippine Government. There are 300 miles of road to be built on the islands of Panay, Negros and Cebu. Construction began on Panay and Cebu in the middle of November and equipment and supplies have been shipped.

PITTSBURG & LAKE ERIE.—A semi-annual dividend of 6 per cent. on the \$10,000,000 capital stock has been declared payable February 1 to the stockholders of record on January 6. The annual rate has been 10 per cent. since 1892.

PITTSBURG, CINCINNATI, CHICAGO & ST. LOUIS.—A semi-annual dividend of 2 per cent. has been declared on the \$24,780,850 common stock payable February 15 to stockholders of record on February 5. The annual rate has been 3 per cent. since 1901, when 1 per cent. was paid.

ROME RAILWAY & LIGHT.—Permission has been asked to amend the charter of the City Electric Railway, of Rome, Ga., changing the name to the Rome Railway & Light Company. The property, consisting of an electric light and power plant and eight miles of road, was recently sold to a Louisville syndicate. It is proposed to increase the authorized capital stock from \$300,000 to \$500,000.

SEABOARD AIR LINE.—A meeting of the stock and voting trust certificate holders has been called for January 10, 1907, to authorize an issue of \$18,000,000 five per cent. bonds. Of this amount it is proposed to issue about \$7,300,000 to the holders of stock and voting trust certificates, at 90 and interest, to the extent of 12 per cent. of their present holdings. The bonds are to be secured by a mortgage covering, subject to prior liens, all the property of the company; they may be additionally secured on such collateral as the directors deem advisable. The proceeds of the sale are to be used to retire short term bonds and notes issued by the company and affiliated corporations.

SOUTHERN PACIFIC.—Gross earnings for the month of October, 1906, were \$10,913,951, an increase of \$1,521,523; net earnings \$4,566,071, an increase of \$970,381.

WESTERN PACIFIC.—According to the *Wall Street Journal*, the underwriters have as yet made no offering of the bonds of this company according to their agreement with the railroad. The Western Pacific is to finish its main line, 800 miles long, by September, 1908, and by that time the syndicate will have supplied about \$45,000,000, for which they will have received about \$8,750,000 in interest. The condition of the bond market and money rates is such that it is evidently cheaper for a strong syndicate to carry such a loan as this rather than sell the bonds.

